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Construction Methods and Equipment

McGraw-Hill Publishing Company, Inc.

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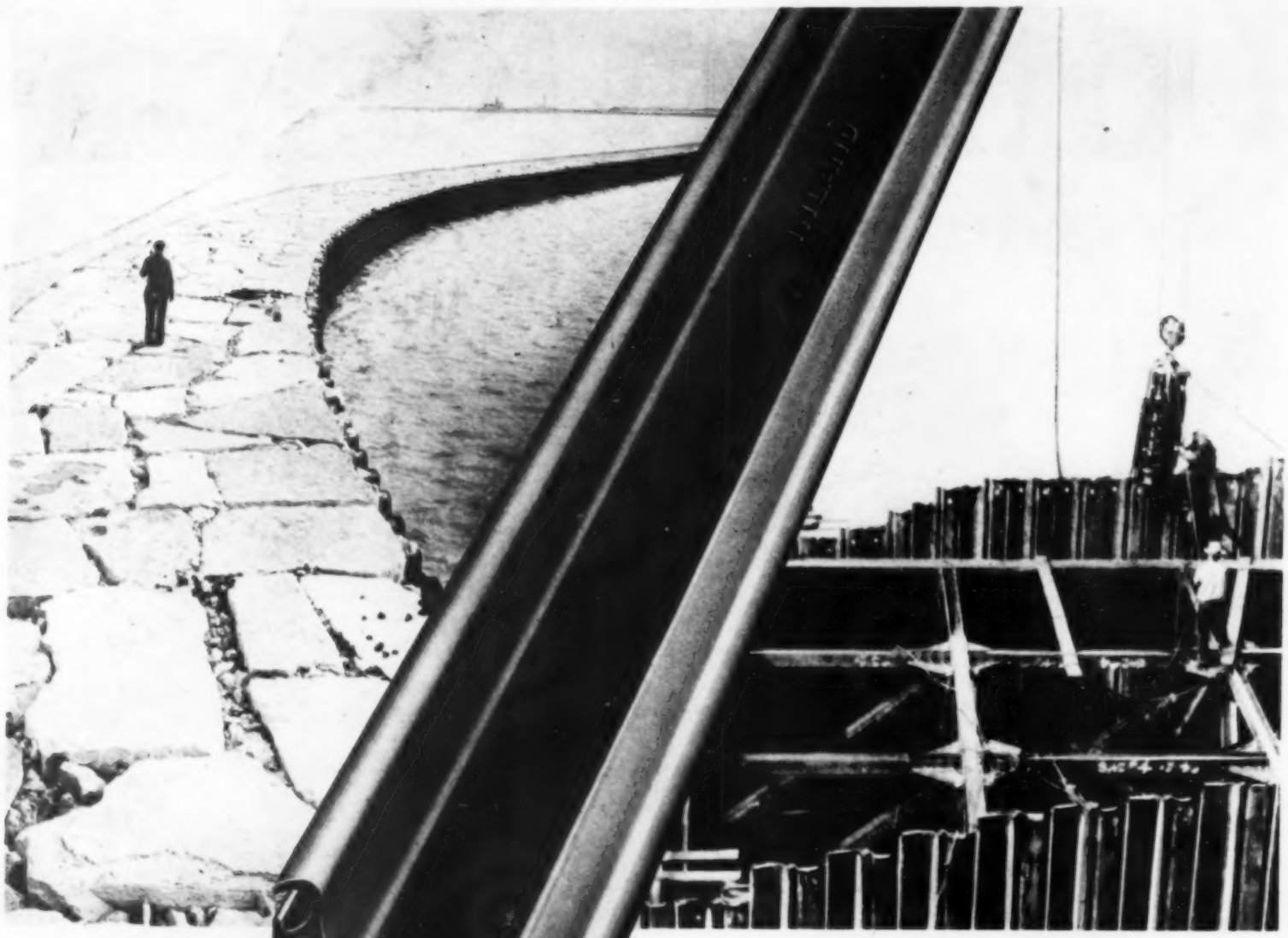
ULTIPLE 70-FT. ARCHES f Buchanan Dam across olorado River of Texas rise igher on sloping buttresses whirler cranes handle con- ete into steel arch forms.

September 1937



A cellular type breakwater on Chicago's lake front.

One of seven successive cofferdams—all built with the same Inland sections.

Permanence . . . . or Repeated Temporary Uses

● Two widely different jobs, but the practical superiority of Inland Steel Piling is being demonstrated today in both kinds of service.

For permanent work Inland's well proportioned sections result in rigid construction, and the interlocks remain tight even under great pressure. Special analysis carbon manganese steel is used for high tensile strength, and copper is added for corrosion resistance when unusually long life is required.

The easy-driving and easy-pulling of Inland Sections without damage to the interlocks save time and dollars for the contractor whose job calls for the repeated use of the same sections for temporary cofferdams.

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TECHNOLOGY DEPT.

CURRENT JOBS

. . . . and Who's Doing Them

Buildings

Public — In New York City, **Wilaka Construction Co.**, New York, took contracts for two high schools at $1,462,166 and $1,387,654; another high school went to **H. R. H. Construction Corp.**, New York, for $1,543,000. Remodeling of main post office in same city was awarded by Treasury Department to **Centaur Construction Co.**, New York, on bid of $1,059,699. At Baton Rouge, La., state office building contract was bid in by **Caldwell Bros. & Hart**, New Orleans, for $1,049,837. General contract for state hospital building, Creedmoor, N. Y., was awarded **Turner Construction Co.**, New York, at $696,500. At St. Thomas, Ont., **Pigott Construction Co., Ltd.**, Hamilton, Ont., will erect six dormitories for $1,000,000, first unit of $3,500,000 hospital. **Fift-Carter**, Greenville, S. C., will build $750,000 hospital for Pulaski County at Hawkinsville, Ga. **Psaty & Fuhrman, Inc.**, New York, presented low bid of $556,000 for New York City building, World's Fair, Flushing. **Turner Construction Co.**, New York, will erect buildings for Navy Department at Carderock, Md., under $2,634,780 contract. **Manhattan Construction Co.**, Oklahoma City, Okla., is contractor for high school, $1,167,740, Tulsa, Okla. **C. Shutrump & Sons Co.**, Youngstown, Ohio, holds $304,580 contract for post office at Johnstown, Pa. Public schools, New York, went to **Depot Construction Co.**, New York, $504,000, and **H. R. H. Construction Co.**, New York, two contracts, $597,000 and $487,000. Low bid of $5,191,000 for government printing office annex, Washington, D. C., was received from **Great Lakes Construction Co.**, Chicago. A $1,561,000 contract for a post office garage, Chicago, went to **Lipman Construction Co.**, Chicago.

Industrial — Sausage casings factory at Chicago, Ill., is to be built by **Visking Corp.**, owner, at cost of $500,000. **White Construction Co., Inc.**, New York, will build plant and office building estimated to cost $500,000 at Grasselli, N. J., for General Aniline Works. Contract for a $4,000,000 hot and cold strip mill at Toronto, Ohio, has been awarded to **United Engineering & Foundry Co.**, Pittsburgh, by Follansbee Bros., Pittsburgh. Pure Oil Co. has awarded contract for cracking plant, Muskogee, Okla., to **Trans-American Construction Co.**, New York, for $925,000. Phosphorus plant, estimated at $1,000,000, Mount Pleasant, Tenn., will be erected by **Stone & Webster Engineering Co.**, New York, for Victor Chemical Works. A $500,000 factory for Frigidaire Corp., Dayton, Ohio, went to **C. Shook, Inc.**, Dayton. In Milwaukee, Wis., mill and warehouse estimated at $1,000,000 for Krause Milling Co. will be built by **Klug & Smith.** Milwaukee. Factory buildings exceeding $500,000 for Corning Glass Co., Corning, N. Y., will be erected by **H. K. Ferguson Co.**, Cleveland. Pennsylvania Power Co. awarded labor on $2,800,000 steam power plant, West Pittsburgh, Pa., to **I. A. Utley**, Detroit. **Stone & Webster Engineering Corp.**, Boston, engineers for Scott Paper Co. plant, Chester, Pa., awarded concrete foundations of $1,250,000 building to **David M. Hunt**, Philadelphia. Refinery at Baton Rouge, La., for Standard Oil Co. of Louisiana, will be built by **Arthur G. McKee Co.**, Cleveland, estimated $500,000. **W. F. Trimble**, Pittsburgh, Pa., will build $750,000 planetarium in Pittsburgh for Buhl Foundation.

Commercial — Apartment house contract, $507,750, has been awarded by University Housing Corp., Durham, N. C., to **T. A. Loving & Co.**, Goldsboro, N. C. In Mountainview, N. J., **Weldon Contracting Co.**, Westfield, N. J., will build 49 homes at total cost of more than $665,500. Campbell Investment Co., Denver, Colo., has awarded contract for $1,000,000 hotel to **Mead & Mount Construction Co.**, Denver. At Painesville, Ohio, **Peck & Udell Construction Co.**, Cleveland, will build $300,000 dial telephone exchange for Ohio Bell Telephone Co. **Day Homes Builders** are erecting first twenty of 300 homes at Short Hills, N. J., total $2,700,000. In Fanwood, N. J., **City Builders, Inc.**, Plainfield, constructs 80 homes, $560,000, of which twenty have been built. Bedford Realty Co., Summit, N. J., plans 42 homes, $500,000, ten of which are under construction. **Putnam Corp.**, Elizabeth, N. J., builds 250 houses, $2,500,000, at rate of 50 per year; 70 already constructed. **N. C. Casciano**, Hartford, Conn., is doing foundation work for $800,000 apartment house of Nathan Herrup, Inc., Hartford.

Highways

Among important highway contracts awarded last month were the following: Colorado: gravel surfacing 3.3 mi. Fremont county and grading 3.9 mi. Teller County to **Driscoll Construction Co.**, Pueblo, Colo., $230,047 and $82,659 . . . Georgia: improving 3.8 mi. Fulton County to **MacDonald Construction Co.**, Atlanta, $269,639 . . . Iowa: improving 7.9 mi. road in Jackson County to **Harrison Engineering & Construction Co.**, Kansas City, Mo., $222,331 . . . Maine: concrete paving 3.7 mi. in Windham to **Warren Bros. Roads Co.**, Cambridge, Mass., $209,271 . . . Michigan: bituminous concrete paving 12 mi. Lake and Mason Counties to **Brooks Construction Co.**, Fort Wayne, Ind., $226,942; concrete paving 4.2 mi. Genesee County to **R. D. Naker**, Royal Oak, $239,773 . . . Mississippi: paving 16.1 mi. Kemper and Landerdale Counties to **Couch Construction Co.** and **Cobb Bros. Construction Co., Inc.**, Dothan, Ala., and **Cobb Bros. Construction Co.**, Meridian, Miss., $363,953; total of 21.6 mi. in three contracts, Moxubee and Marshall Counties, to **Carey-Reed Co.**, Jackson, Miss., $448,442 . . . New Mexico: grading, drainage, structures, bridge, 13.6 mi. Sierra County to **Hayner & Burn**, Albuquerque, $200,924; 9.5 mi. Socorro and Sierra Counties to **Sharp & Fellows Construction Co.**, Los Angeles, Calif., $200,885 . . . New York: improving 12.9 mi. in Jefferson County to **Madison Construction Co., Inc.**, Madison, N. Y., $529,281; 15 mi. Clinton County to **Mid State Builders Inc.**, Utica, $351,294; grading Beach Channel Drive and constructing bulkheads, New York City, to **A. M. Hazell, Inc.**, Brooklyn, $933,587; improving 7 mi. Washington County to **Warren Bros. Roads Co.**, Cambridge, Mass., $279,181 . . . Ohio: grade-crossing elimination, Cuyahoga County, to **C. B. Moon Co.**, Cleveland, $472,563; improving 3.34 mi. Ashtabula County to **Koski Construction Co.**, Ashtabula, $312,011 . . . Pennsylvania: surfacing 3.44 mi. Franklin County to **H. W. Shaull & Sons**, Mechanicsburg, $231,707; low bid of $533,401 for grading, concrete paving and two bridges, Beaver County, received from **Pennsylvania Quarry Stripping & Construction Co.**, Hazelton, Pa.; paving and structures 4.9 mi. Somerset County to **Roberts Paving Co.**, Salisbury, Md., $639,017 . . . Washington: grading and surfacing 5 mi. Chelan County to **Goetz & Brennan**, Seattle, $258,656 . . . Wisconsin: concrete surfacing 9.9 mi. Grant and Lafayette Counties to **J. Cape & Sons**, Racine, $220,945.

Bridges

Low bids for superstructure of Blue Water International Bridge between Port Huron, Mich., and Point Edward, Ont., were received as follows: main spans, $767,279, from **American Bridge Co.**, Detroit; American approach, $386,576, from **Wisconsin Bridge & Iron Co.**, Milwaukee, Wis.; Canadian approach, $514,490, from **Hamilton Bridge Co.**, Hamilton, Ont., and **Sarnia Bridge Co.**, Sarnia, Ont. **National Excavation Corp.**, New York, offered low bids of $743,273 to add upper deck to Henry Hudson bridge and $418,000 for superstructure of southerly unit, Flushing Bridge, New York. Contract valued at $206,190 for bridge over railroad at Newington, Conn., went to **Arute Bros.**, New Britain, Conn. Triborough Bridge Authority, New York, awarded construction of anchorages of Bronx-Whitestone bridge to **Corbetta Construction Co.**, New York, $929,560. Bridges in Westchester County, N. Y., will be built by **F. Berlanti & Son, Inc.**, White Plains, under $332,994 contract. **A. G. Tomasello & Sons, Inc.**, Boston, holds $245,112 contract for two Massachusetts bridges.

Waterworks

San Francisco, Calif., awarded contract for concrete lining, roof and control works of Sunset Reservoir to **MacDonald & Kahn**, San Francisco, $793,397. In Flushing, N. Y., **Di Salvo Contracting Co.**, East Elmhurst, N. Y., will lay watermains under $219,885 contract.

Sewers

Low bid of $569,771 by storm sewers in Long Island City, N. Y., was received from **Di Salvo Contracting Co.**, East Elmhurst, N. Y. Contract for another sewer, Long Island City, was awarded to **Luang Construction Co.**, Brooklyn, for $601,821. **S. A. Healy Co.**, Chicago, entered low bid of $849,482 for Oakwood interceptor, Detroit. Brooklyn sewer construction went to **P. Tomasetti Contracting Co.**, Brooklyn, for $1,861,334. Harbor crossing at Buffalo, N. Y., was awarded at $382,249 to **L. A. Wells Construction Co.**, Cleveland. In Barberton, Ohio, **L. C. Love**, Dayton, will build part of sewage disposal plant under $250,858 contract.

Miscellaneous

Seattle, Wash., awarded contract for Ruby dam to **General Construction Co.**, Seattle, and **J. F. Shea Co.**, Portland, Ore., $3,967,785.

Construction Methods and Equipment

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SEPTEMBER, 1937

The "How" of it

For the benefit of readers concerned with the practical application of method or equipment the following references are to articles or illustrations in this issue that tell:

How **STEEL TRUSSES** framed into skeleton of church tower supported hanging scaffold. — p. 39

How **GLASS BLOCKS** and nickel-silver trim formed curtain walls of city office building. — p. 40

How **SPILLWAY TUNNEL** at Seminoe Dam was built through short section of open cut. — p. 41

How **TWO MIXING PLANTS** supplied concrete for Buchanan Dam. — p. 44

How **SLED-SHAPED FRAME** of concrete bucket facilitated filling from trucks. — p. 44

How **STARTER FORMS** were erected to piece out bottom of steel arch forms for multiple-arch dam. — p. 45

How **LIFT FORMS** cut cost of concrete house construction. — p. 50

How **INSULATING BOARD** served as inside form for concrete house walls. — p. 51

How **REINFORCED PAPER** bent to proper shape formed ribbed concrete house walls. — p. 52

How **WELDED CONNECTIONS** saved weight in steel frame of hospital wings. — p. 53

How **EMPLOYMENT RECORDS** on four grade separations showed large man-hour figures in low-wage localities. — p. 54

How **WINDING MACHINE** applied reinforcing wire at desired spacing to metal cylinder of steel-cored R.C. pipe. — p. 57

How **SPECIAL BUCKETS** placed concrete on both sides of cylinder in steel-cored concrete pipe. — p. 58

How **DRIFTER DRILL** put down holes 80 ft. deep in granite.—p. 62

How **LONGITUDINAL LAYING** of paving brick permitted great number of droppers to work. — p. 64

How **MARKING BED** into longitudinal lanes aided spacing of longitudinal brick courses. — p. 64

How **SHEAR DEVELOPERS** united concrete wearing surface with timber slab in composite bridge decks. — p. 65

How **FIVE TRANSPORTING METHODS** have served to move bulk cement on various jobs. — p. 66

How **SPECIAL TRUCKS AND TRAILERS** hauled cement for large projects. — p. 68

ROBERT K. TOMLIN, Editor — WILLARD CHEVALIER, Vice-President

Editorial Staff: Vincent B. Smith, John B. Huttl (San Francisco), Paul Wooton (Washington), Nelle Fitzgerald

The Editor Makes a Point

IF THIS JOURNAL has any one paramount mission, it is to talk with construction men in their own language about the things that interest them. Moreover, it is to keep that talk practical and useful in the highest degree. It is a "HOW" paper, first, last and all the time.

And there can be no doubt that this sort of service is wanted by construction men and valued by them when they find it. Not long ago that department of the paper, formerly entitled "Getting Down to Details," blossomed forth with a new head, "How They Did It — Construction Details for Superintendents and Foremen." The immediate increase in the response of construction men to the items published in that department was convincing evidence of their keen interest in all that has to do with the HOW of their jobs.

That is why the editors are at pains to select, from the wealth of HOW material contained in the many articles of each issue, a good representative list of the brass-tacks and bread-and-butter items for the sample bill-of-fare on the contents page. They were put up to this by a reader who pointed out how easily some readers might miss such ideas when they happen to be included in a long article dealing with other aspects of a job. It was a good tip and both the paper and its readers have benefited from it.

NATURALLY the HOW of any construction operation involves the materials and equipment used as well as the methods employed. This is not confined to construction — it is generally true of all sorts and conditions of industry. The wise manufacturer of materials or equipment, alert always to strike an advertising note in harmony with his medium, is very likely to get a HOW note into his advertising message.

That is why the magazine *Industrial Marketing* recently devoted the bulk of its "O.K. as Inserted" department to a discussion of HOW copy in industrial advertising. Interestingly enough, its editor found a prize illustration of his point in the editorial pages of this paper. But let him tell it his own way:

"We started looking for 'how-to' ads in business papers, and lo and behold, the first thing we ran across was on the contents page of the June *Construction Methods and Equipment*. The editor of this paper is a smart and practical gentleman. Right smack under the masthead appears, in nice big print, 'The HOW Of It,' followed by 'For the benefit of readers concerned with the practical application of method or equipment, the following references are to articles or illustrations in this issue that tell:' And under this appear no less than twenty-eight 'how' reference points, all comparable to this sample: 'HOW mixing plant was planned to place 1,000,000 cu. yd. of concrete in 600 days — see Page 65.'."

THE EDITOR returns the clipping containing the quotation to this writer with a note: "Very nice, indeed. Thanks for the chance to see this. That's just the point I wanted to drive home in my HOW index. R.K.T. — P.S. Incidentally, I'm no advertising man but just speaking as an editor, I should think that the combination of HOW advertising copy with HOW editorial copy ought to make *Construction Methods and Equipment* a 'natural' for the man who has anything he wants to sell to construction men."

Well, he may not be an advertising man, but it sure looks as though he has something there.

Willard Chevalier

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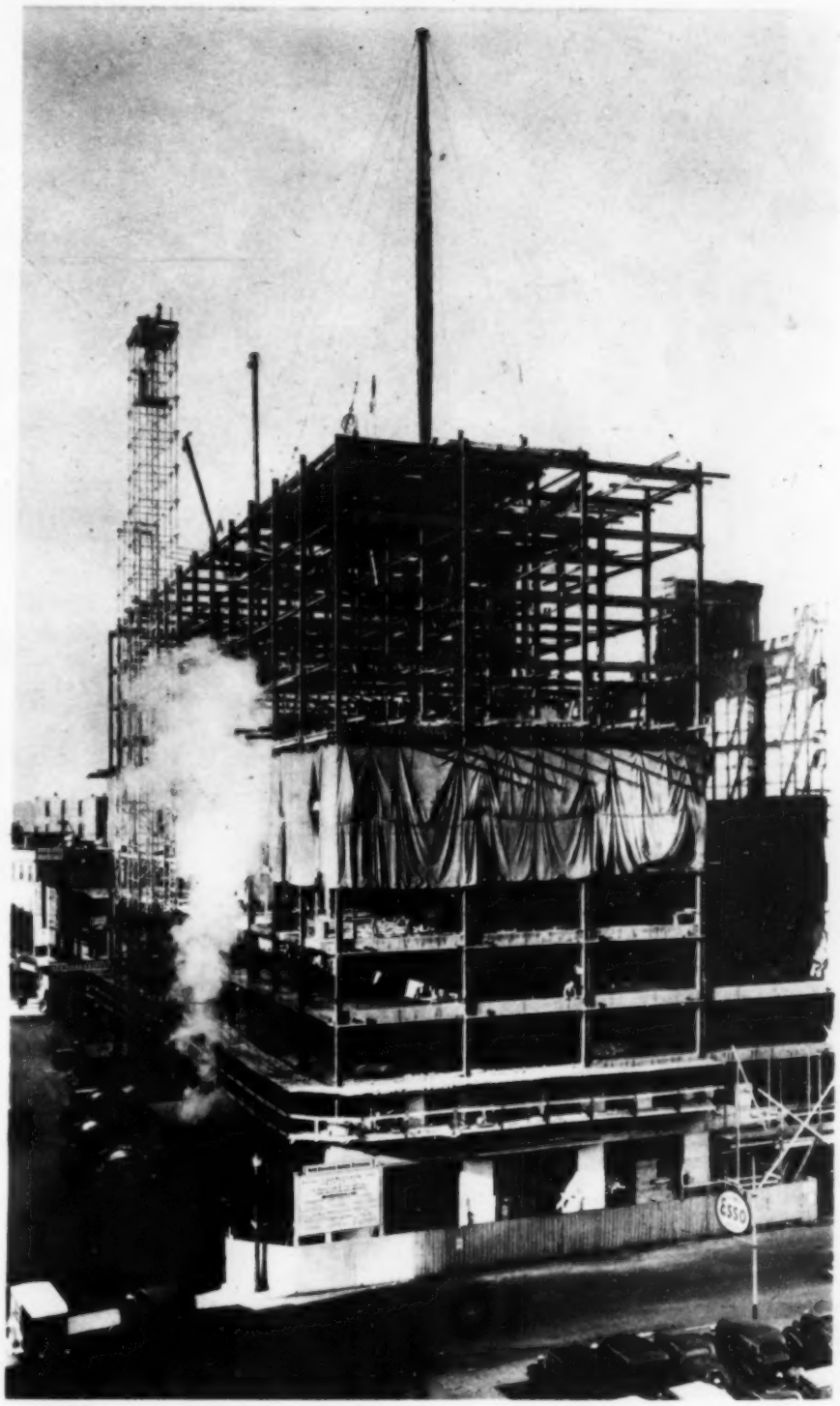

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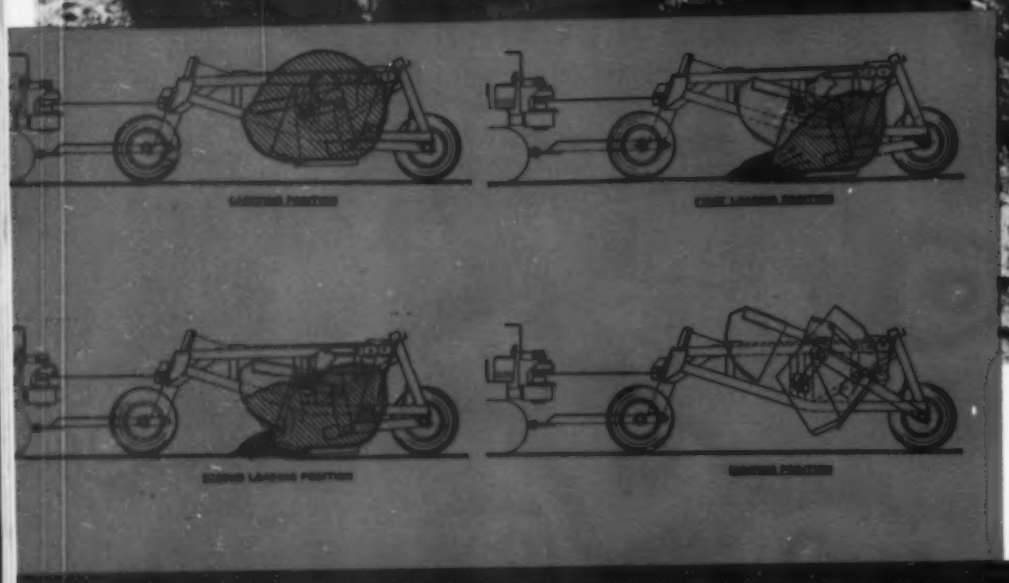

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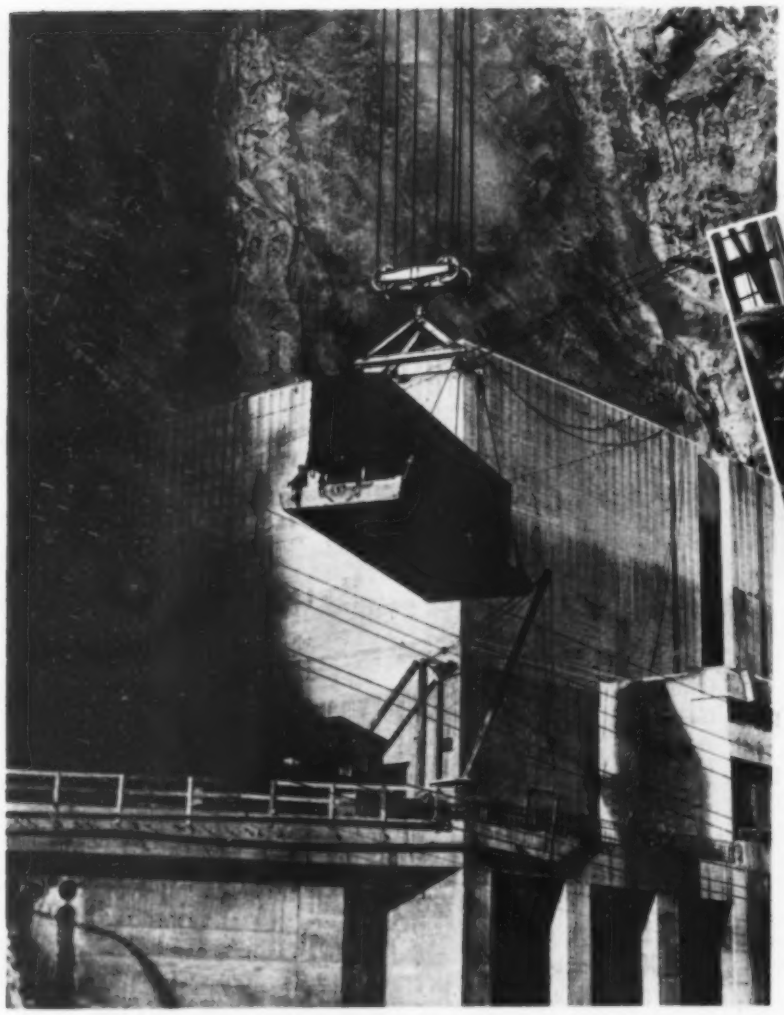

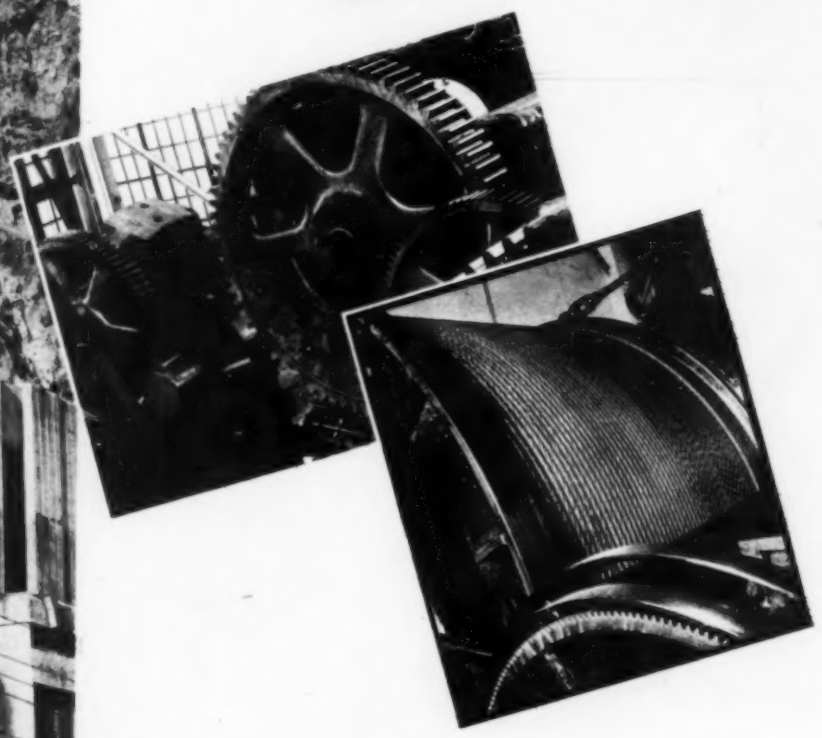

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- **The maker of "Caterpillar" recommends "RPM" Diesel Engine Lubricating Oil**

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- **Distributors of "Caterpillar" recommend "RPM" Diesel Engine Lubricating Oil**

Typical of the letters in our files from "Caterpillar" distributors everywhere, is the following: "Have given 'RPM' Diesel Engine Lubricating Oil a test for a year in more than 100 Diesel units. Have reconditioned many used Diesel tractors and found the pistons free from carbon when using 'RPM'."

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An Oregon contractor writes: "Have used 'RPM' Diesel Lubricating Oil exclusively in Koehring No. 701 shovel ever since its purchase. Shovel operating 15 hours a day in heavy work. Have had no lubrication trouble whatsoever."

A Michigan contractor writes: "Caterpillar" Diesel Tractor operated 24 hours a day for the greater part of the year using "RPM" Diesel Engine Lubricating Oil. After a year of service overhauled the engine and found piston and rings clean and free."

An Alabama "Caterpillar" distributor writes: "Have watched 'RPM' Diesel Engine Lubricating Oil perform under every type of service, since in our territory 'Caterpillar' Diesels are employed in every conceivable type of work. 'RPM' Diesel Engine Lubricating Oil performance is outstanding."

[Caution— There is only one Diesel Engine Lubricating Oil identified by the "RPM" trade-mark.]

A New York "Caterpillar" distributor writes: "Sold an RD-8 tractor with Le Tourneau Scraper to a contractor and after 3 months' use we took it down and inspected it. Found ring grooves, etc., to be perfectly clean. 'RPM' Diesel Engine Lubricating Oil had been used exclusively."

"RPM" Diesel Engine Lubricating Oil Is Distributed in the United States by:

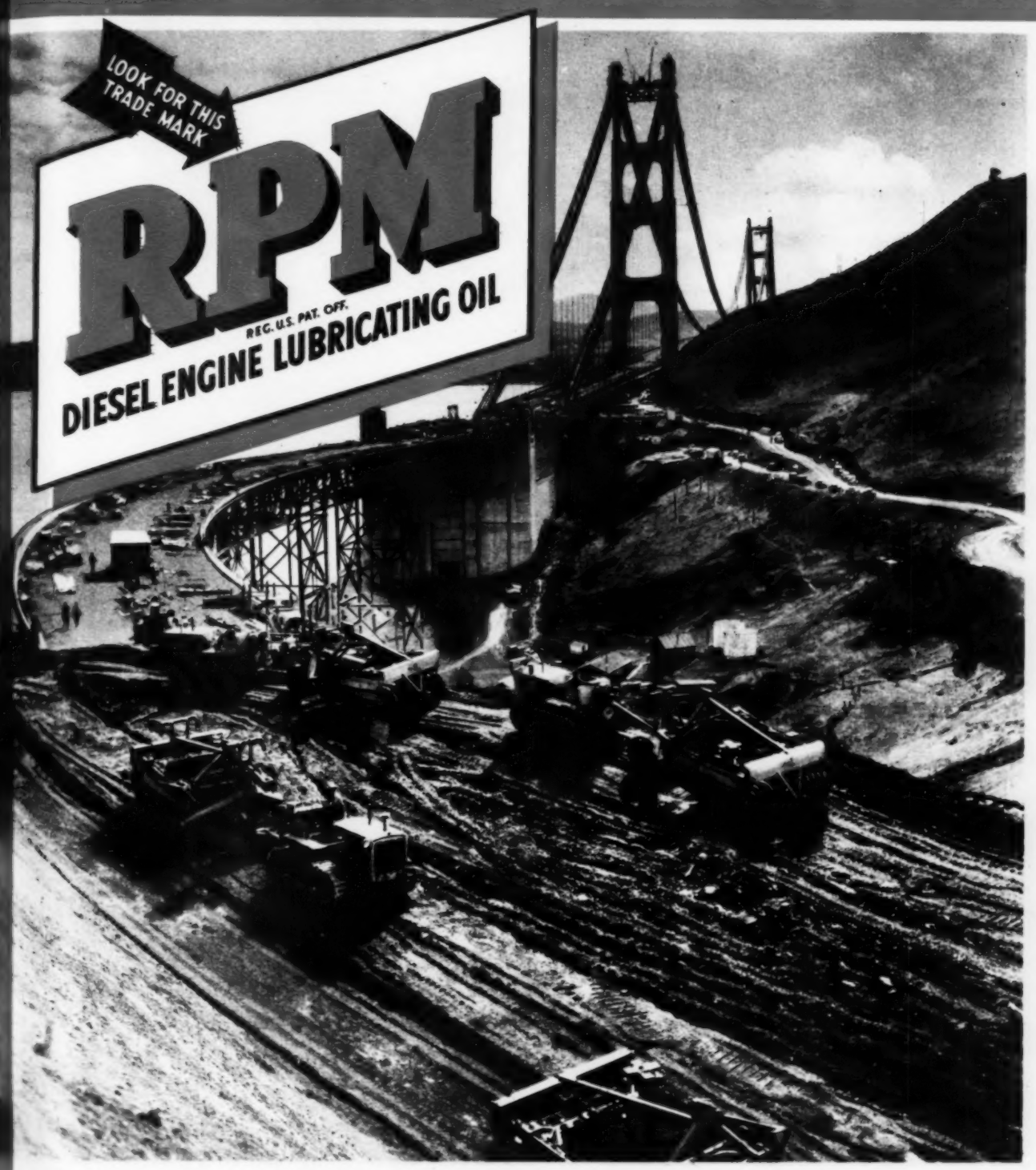
CALIFORNIA COMPANY, THE (Distributors in Montana)
CARTER OIL COMPANY, THE (Tulsa, Oklahoma)
COLONIAL BEACON OIL COMPANY, INC.
HUMBLE OIL & REFINING COMPANY
STANDARD OIL COMPANY (Indiana)
STANDARD OIL COMPANY (Incorporated in Kentucky)
STANDARD OIL COMPANY (Nebraska)
STANDARD OIL COMPANY (Ohio), THE
STANDARD OIL COMPANY OF CALIFORNIA
STANDARD OIL COMPANY OF LOUISIANA
STANDARD OIL COMPANY OF NEW JERSEY
STANDARD OIL COMPANY OF PENNSYLVANIA
STANDARD OIL COMPANY OF TEXAS

In Canada by:

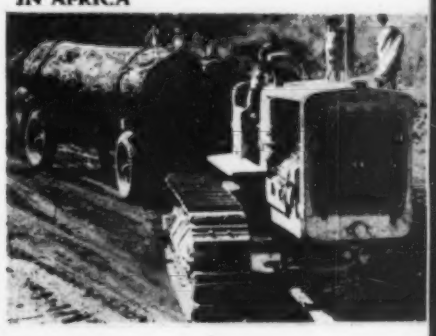
IMPERIAL OIL LIMITED
STANDARD OIL COMPANY OF BRITISH COLUMBIA LIMITED
—and by distributors in more than 100 other countries.

PERFORMANCE

. . . KEEPS PISTON RINGS CLEAN AND FREE



IN AFRICA



IN HAWAII

IN ENGLAND

IN LATIN AMERICA

Another big saving added to the economy of "Caterpillar" Diesel Engine operation

"RPM" Diesel Engine Lubricating Oil gives full power under sustained loads and heat. Freedom from carbon and sludge deposits. Minimum blow-by.

Greater sustained power! Bigger output! Lower operating costs! Bigger profits! To get that, you, as a *"Caterpillar" Diesel owner,* bought a *Diesel—a different kind* of an engine. One of the reasons why a Diesel can give you this kind of performance is because it operates under exceptionally high unit pressures. To operate under such pressures, however, complete freedom of piston-ring action is absolutely essential. In other words—to sustain such performance—to assure top-notch results—proper *lubrication* is essential. And *that* is what "RPM" Diesel Engine Lubricating Oil was designed to give you.

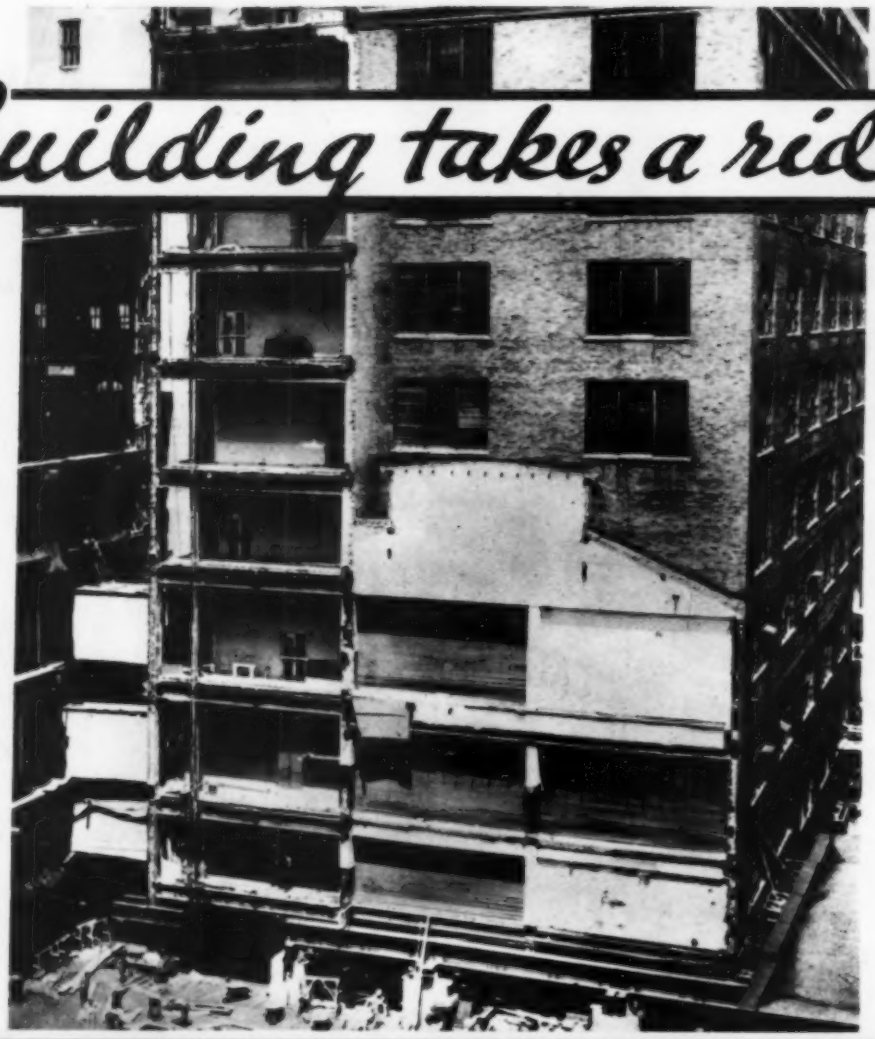
With its tough film of high oiliness, specially compounded "RPM" Diesel Engine Lubricating Oil keeps your Diesel engine lubricated. Keeps rings clean—free from carbon. Minimizes blow-by and power losses. Prevents sludge. Keeps oil channels open—oil controls free-acting.

Caterpillar Tractor Co. recommends "RPM" Diesel Engine Lubricating Oil. "Caterpillar" distributors service their engines with it. "Caterpillar" owners acclaim it. They'll *all* tell you that after thousands of hours of blistering, heavy load operation, *with "RPM" Diesel Engine Lubricating Oil,* piston rings continue to move freely at the slightest touch of a finger—cylinder walls remain smooth, without a trace of scoring.

Try "RPM" Diesel Engine Lubricating Oil. Learn why patented "RPM" Diesel Engine Lubricating Oil is the most widely used Diesel engine lubricating oil in the world.

STANDARD OIL COMPANY
OF CALIFORNIA

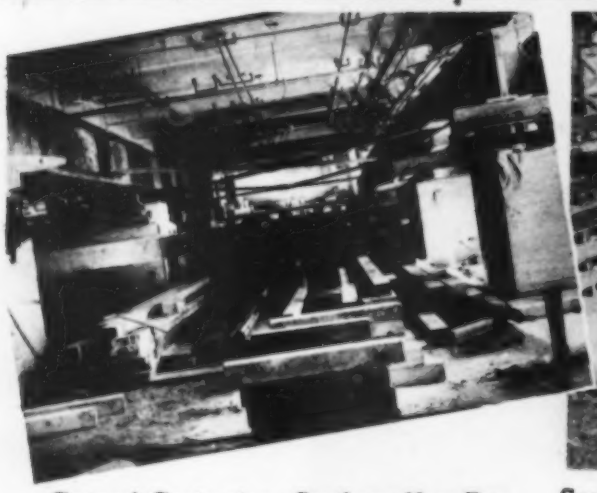
9 Story Building takes a ride

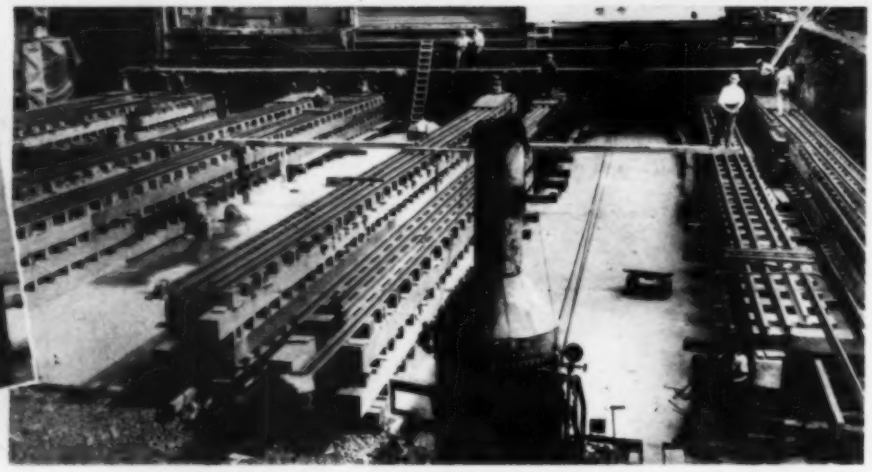


This building—the second largest building moving job on record—was moved 110 feet to the opposite side of the block. Within this Hartford, Conn., department store, business continued as usual and even the three elevators kept running. Water, gas and electric services were maintained by flexible connections. In preparation, a series of concrete piers were built—each to carry a building load of 300 tons. From these piers, the building on a cradle was jacked up three-quarters of an inch from its old foundations. The moving was over 1600 steel rolls which revolved on standard railroad tracks supported by heavy cribbing. Donkey engines supplied the pulling power for the 36-hour ride.

The lower pictures show the temporary concrete piers at the old site and the new concrete floor with cribbing and track ready to receive the load.

QUICK SERVICE CONCRETE SUPPORTS 16,000,000 LBS.





General Contractor: Southern New England Contracting Co., Hartford, Conn.

Speed with safety was achieved by the use of Lehigh Early Strength Cement. Forms were stripped from the piers the day after pouring—in 48 hours the concrete was put to work. The new floor was in active use two days after pouring. This is an illustration of the adaptability of Lehigh Early Strength Cement in meeting the problems of an unusual engineering project. Compared with normal portland cement, Lehigh Early Strength Cement makes better concrete of equal strength in one-third to one-fifth the time. Contractors use it for concrete that must be put to work quickly—to reduce overhead by shortening construction time—to save on form cost by prompt re-use—to safeguard concrete against cold weather—to reduce heat protection costs—and to coordinate construction schedule by speeding up key portions of the job.

LEHIGH PORTLAND CEMENT COMPANY
ALLENTOWN, PA. CHICAGO, ILL. SPOKANE, WASH

LEHIGH EARLY STRENGTH CEMENT

new 303 KOEHRING

KOEHRING HEAVY DUTY

Again, **a completely new excavator by Koehring—ultra modern in design—speedy operation — economical in upkeep. Enclosed gears, anti-friction bearings, high line speeds, and selective swing speeds are important profit-earning features. The new Koehring 303 is a ¾ yard shovel and a 1 yard dragline or crane, fully and quickly convertible.**

KOEHRING COMPANY

Pavers · Mixers · Shovels · Cranes · Draglines · Dumptors · Mud-Jacks

3026 WEST CONCORDIA AVENUE MILWAUKEE, WISCONSIN

IN PREFORMED ROPE
INSTALLATION
IS LESS COSTLY
If loops are pulled, irreparable kinks are formed in a Wire Rope.
WICKWIRE SPENCER

Select the Rope that Fits Your Job

Wisscolay Preformed Wire Rope is inherently limp. It has no tendency to form into loops while being threaded through equipment. The time-consuming care required to avoid looping of non-preformed rope is not necessary when handling preformed rope. Threading is done with a minimum of stoppage and delays and the entire installation is quicker and less expensive. Savings in installation costs and economies of use many times offset the slightly higher purchase price of Wisscolay Rope. Write today for full particulars.

•

WICKWIRE SPENCER STEEL COMPANY, *General Offices:* 41 East 42nd Street, New York. *Sales Offices and Warehouses:* Worcester, New York, Chicago, Buffalo, San Francisco, Los Angeles; *Export Sales Dept.:* New York.

WICKWIRE SPENCER SALES CORPORATION, New York, Chattanooga, Tulsa, Portland, Seattle.

WIRE ROPE
by Wickwire Spencer

Wickwire Spencer also manufactures all sizes and types of Wire Rope in Wisscolay.

WICKWIRE SPENCER STEEL COMPANY
41 East 42nd St., New York City

Please send me my free copy of your popular, new money saving manual, "Know Your Ropes".

Name_____

Firm_____

Address_____

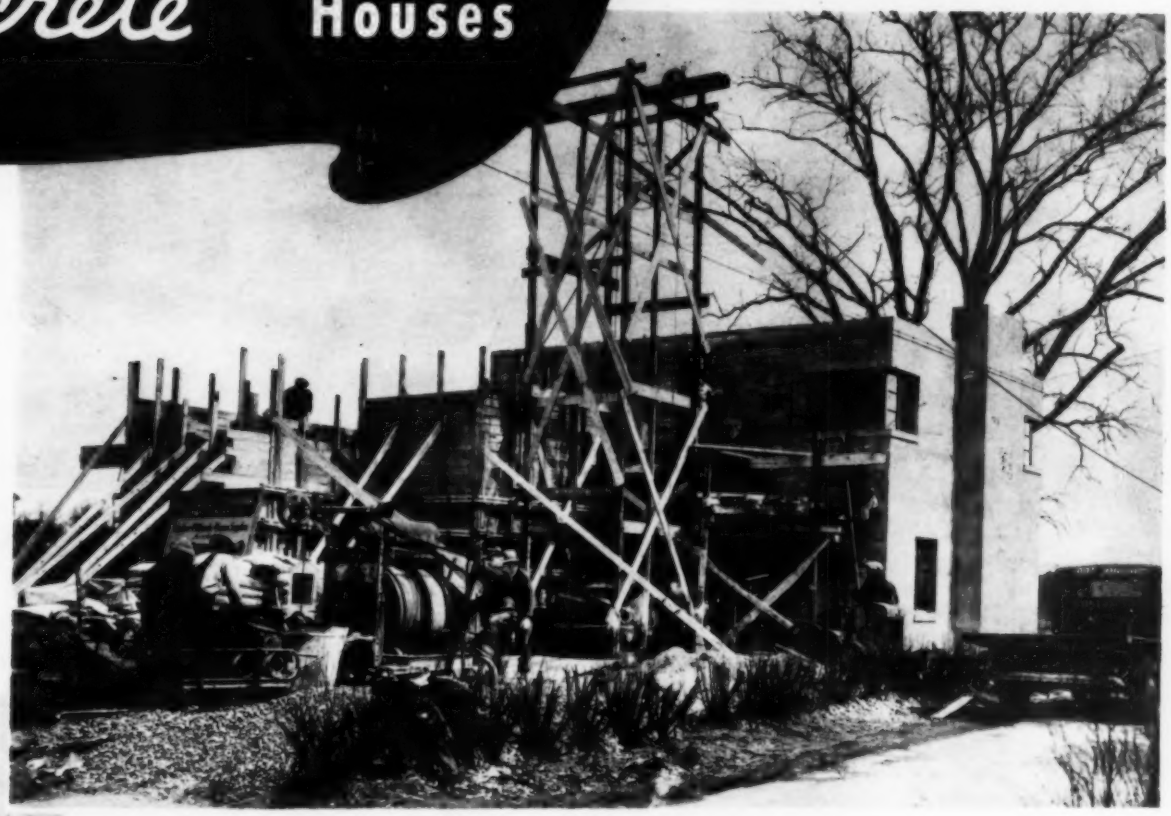
City_____ State_____

BIG PROFITS AHEAD!

For Builders of Reinforced *Concrete* Houses

Member of General Contracting Firm turns to Concrete Houses!

Monolithic concrete house, South Bend, Ind. Built in 1936 by Art Jordan of the C. A. Jordan Co. Walls are 6-inch reinforced concrete with 1-inch rigid insulation bonded to concrete; second layer of ½-inch insulation furred and used as plaster base. Exterior walls rubbed and coated with portland cement paint. Concrete floors.



The success of Jordan's first house of reinforced concrete has resulted in the erection of more houses with the same basic advantages which only concrete can give.

Detail of form construction. Note that the insulation and furring strips serve as the inside forms.

If you are looking for a promising new field in which to employ your knowledge of concrete and your experience as a contractor or engineer — consider reinforced concrete houses!

A single house may seem like a small-time operation, and it is. But there are thousands of these single houses to be built. Many realtors and developers today are planning large home projects, some running into hundreds of houses in a single development. Get in touch with the leading realtors of your community. You can both benefit from the present swing to concrete.

This type of home offers the buyer more for his money — rare charm in any architectural style; *real* firesafety; rigidity; low upkeep; slow depreciation; year-'round comfort; protection against termites, dampness, storms.

The first cost of the complete house is little more than that of non-firesafe construction.

Contractors who in the past have built everything from bridges to skyscrapers are considering this market. Some plan to build complete houses; others, only the concrete structure and surrounding appurtenances as subcontractors. Investigate this opportunity. Hook up with the leading realtors in your community and become established as a concrete home builder. Let us send you the new edition (just out) of our practical manual, *"Reinforced Concrete Houses — Design and Construction Details."*

PORTLAND CEMENT ASSOCIATION

Dept. 9-16A, 33 West Grand Avenue, Chicago, Ill.

Please send me "Reinforced Concrete Houses — Design and Construction Details."

Name.....

Company.....

Address.....

City..... *State*.....

CHARLES T. MOEBIUS, PRESIDENT

DUMP TRUCK SERVICE, INC.

HAULING CONTRACTORS

SLAG, CINDERS, GRAVEL AND BUILDING MATERIALS

OFFICE: 50 WECKER STREET

BUFFALO, N.Y.

July 15, 1957

The Thew Shovel Company
Lorain,
Ohio

Gentlemen:

I am attaching a photograph showing my two new Lorain 77's handling 80,000 yds. of excavation and 1,000,000 sq. yds. Grading for the new Chevrolet plant.

That I like these machines goes without saying, for ever since I bought my first Lorain in 1929 I have been a booster. Today I have 5 Lorains and a Universal Truck Crane.

However, these two new 77's are the standouts of the lot. When I got my first 77 in February 1957, I realized I was getting something entirely new and different in shovel boom designs. Naturally I watched it carefully and my purchase of a second 77 only 4 months later shows what I think of this new development. It certainly lives up to every claim made for it.

These are the two 77's shown in the photo I am sending you.

Yours very truly

DUMP TRUCK SERVICE, INC.

Chas. T. Moebius, Pres.

CTM:fh
Enclosures

P.S. For downright digging strength, the new 1½-yd. Lorain-77 shovel boom is in a class by itself. The combination of a separate torsional unit with structural side members results in a boom designed accurately for twisting as well as bending and compression stresses. This torsional unit, consisting of a huge seamless tube, and the structural side members function independently of each other to give exceptional strength at minimum weight. The boom's 18-ft. tubular steel dipper stick also offers the greatest torsional and bending resistance per lineal foot of weight.

This new shovel boom is not a drawing board dream. It has proved its worth in dirt and rock. Get the facts. Write for Lorain-77 catalog describing this revolutionary development.

THE THEW SHOVEL COMPANY
LORAIN, OHIO

LORAIN "77"

NEW LORAIN BOOM *Makes Good*

-In Quarries

-On Road Work

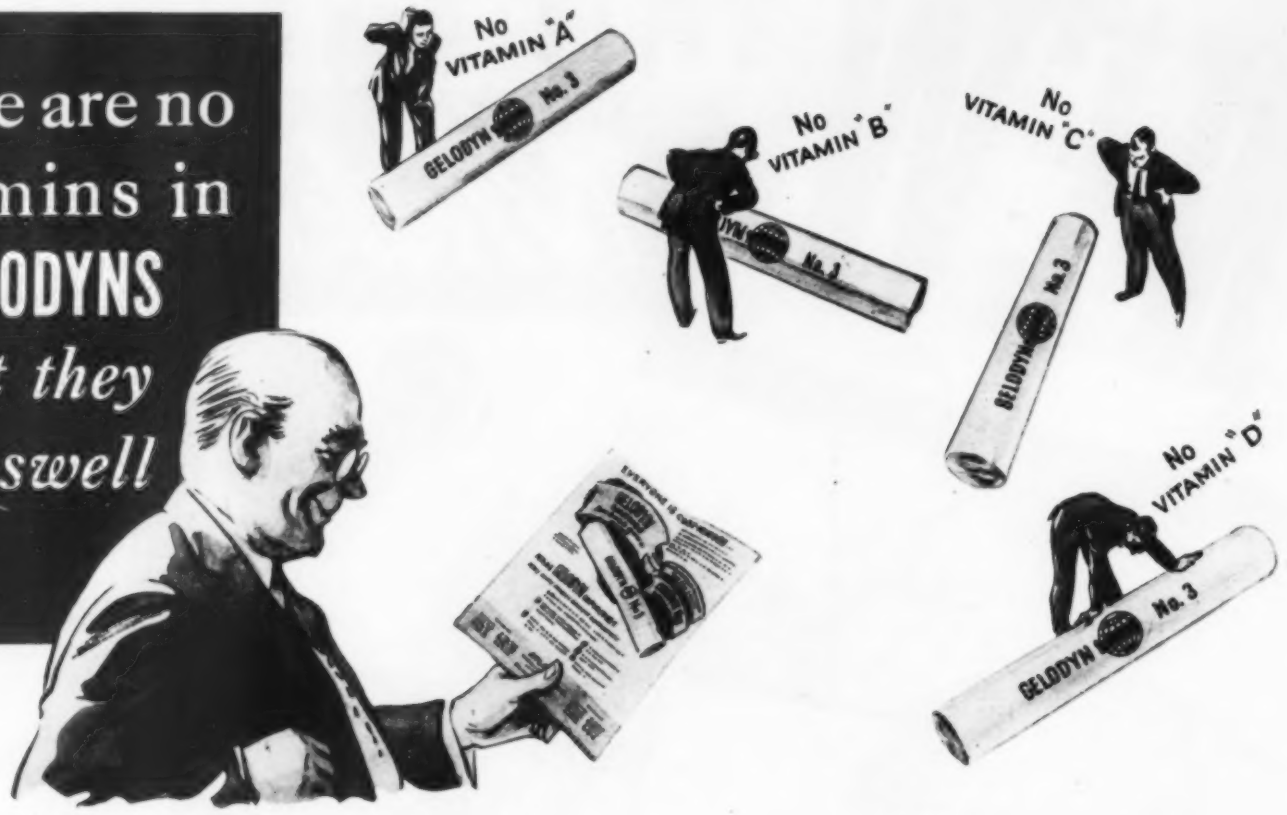
-On General Excavation

THEW CENTER DRIVE

1½ YD

LORAIN "77"

There are no vitamins in **GELODYNS** ...*but they do a swell job*



Not a Vitamin in the lot . . . *yet* that doesn't prevent a fellow from writing an advertisement about ATLAS **GELODYN**

WE CAN'T "talk about taste or flavor"—but the story of Atlas Gelodyns is a story to "whet the appetite" of any contractor who *thinks in terms of saving.*

Where gelatin type explosives are involved, Atlas Gelodyns, semi-gelatinous type explosives, effect worth-while economies on many jobs.

In the first place, a case of Atlas Gelodyn No. 3 averages 120 cartridges instead of about the 95 cartridges you'll find in a 50-lb. case of standard 40 and 50% ammonia gelatin explosives and Gelodyns can often be substituted stick for stick. Second—Atlas Gelodyns provide better water resistance than non-gelatinous explosives.

Atlas Gelodyns are plastic—so they can be retained in upward pitching bore holes. They provide satisfactory fumes for most underground work—and deliver more explosive energy per dollar of cost.

ATLAS POWDER COMPANY, WILMINGTON, DEL.

Cable Address—Atpowco

Everything for Blasting

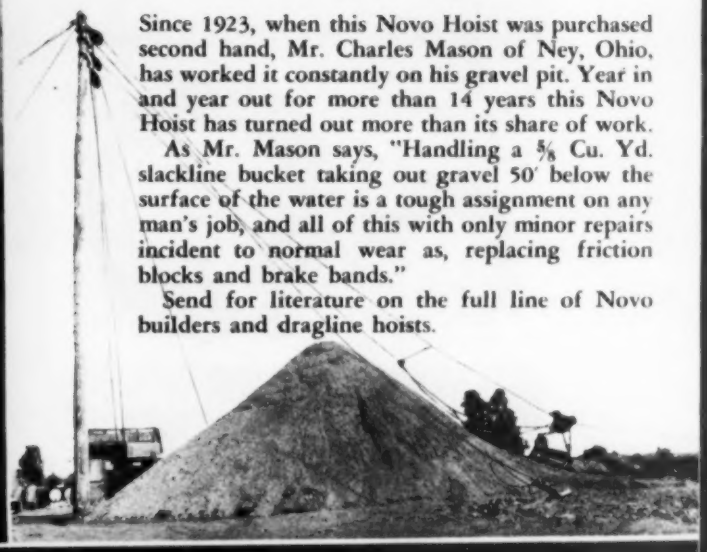
OFFICES

Allentown, Pa.	Joplin, Mo.	New Orleans, La.	Pittsburgh, Pa.	Spokane, Wash.
Boston, Mass.	Kansas City, Mo.	New York, N. Y.	Portland, Oregon	St. Louis, Mo.
Butte, Mont.	Knoxville, Tenn.	Philadelphia, Pa.	Salt Lake City, Utah	Tamaqua, Pa.
Denver, Colo.	Los Angeles, Calif.	Picher, Okla.	San Francisco, Calif.	Wilkes-Barre, Pa.
Houghton, Mich.	Memphis, Tenn.	Pittsburg, Kansas	Seattle, Wash.	

ATLAS
EXPLOSIVES

CHEMICALS ATLAS EXPLOSIVES

NOVO in the NEWS



Since 1923, when this Novo Hoist was purchased second hand, Mr. Charles Mason of Ney, Ohio, has worked it constantly on his gravel pit. Year in and year out for more than 14 years this Novo Hoist has turned out more than its share of work.

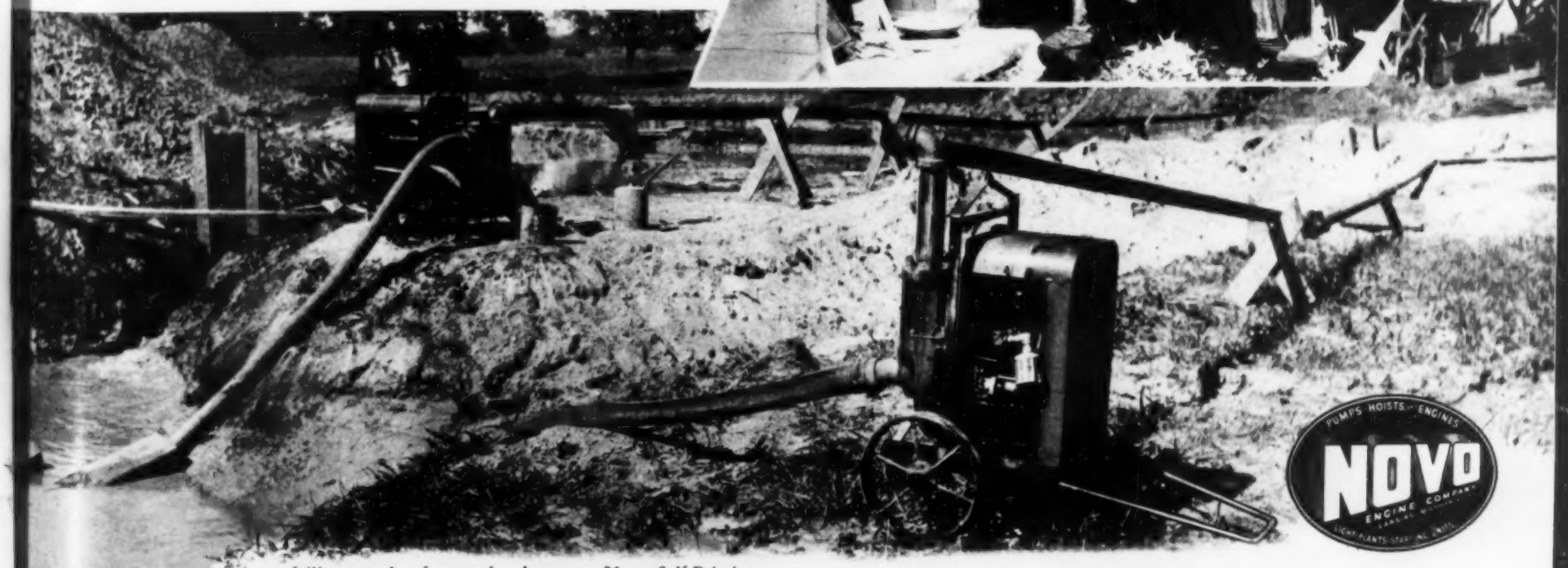
As Mr. Mason says, "Handling a ⅝ Cu. Yd. slackline bucket taking out gravel 50′ below the surface of the water is a tough assignment on any man's job, and all of this with only minor repairs incident to normal wear as, replacing friction blocks and brake bands."

Send for literature on the full line of Novo builders and dragline hoists.

From 30′ below the surface this Novo 2″ Self-Priming Centrifugal Pump is pumping the seepage water from the East River out of that big intersepting sewer in New York City, leading to the disposal plant on Wards Island.

Rossoff Tunnel Corporation, the Contractors know their pumps as well as their tunnels. They have 5 Novo Self-Primers on this job. A. H. Diamant, Vice-President of the above company, reports, "Unfailing, highly efficient operation on those Novo Pumps. The Pumps that you can't beat for they have the largest, most powerful engines that you will find on self-priming pumps."

The same holds true of the Novo complete line of Pressure, Diaphragm, and Road Pumps. Send for full information.



An unfailing supply of water by these two Novo Self-Priming Pumps, a 3″ and a 4″, pumping water for gravel washing, demonstrates the head against which Novo Pumps will work; also, the sustained volume delivered which is necessary for gravel washing at the top of the plant in the distance. Owner, Consolidated Construction Co., Birdville, Texas.

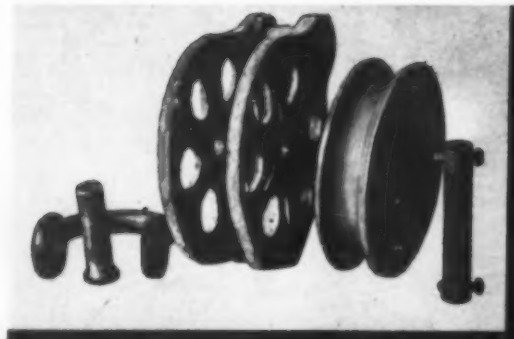
Send for special bulletin on Self-Priming Pump jobs.

NOVO ENGINE CO.

214 Porter St., LANSING, MICH.

BUCYRUS-ERIE

RED ARCH DRAGLINE BUCKETS FOR BIG OUTPUT



FREE RUNNING, OIL POCKET, DUMP SHEAVE

CONVENIENT, STURDY BECO RINGS AND LINKS

TOUGH, HEAT-TREATED DRAG BAIL SOCKET

THREE TYPES: AU . . . LIGHT; AX . . . MEDIUM; Y . . . HEAVY

RUNNER BARS FOR LONGER LIFE

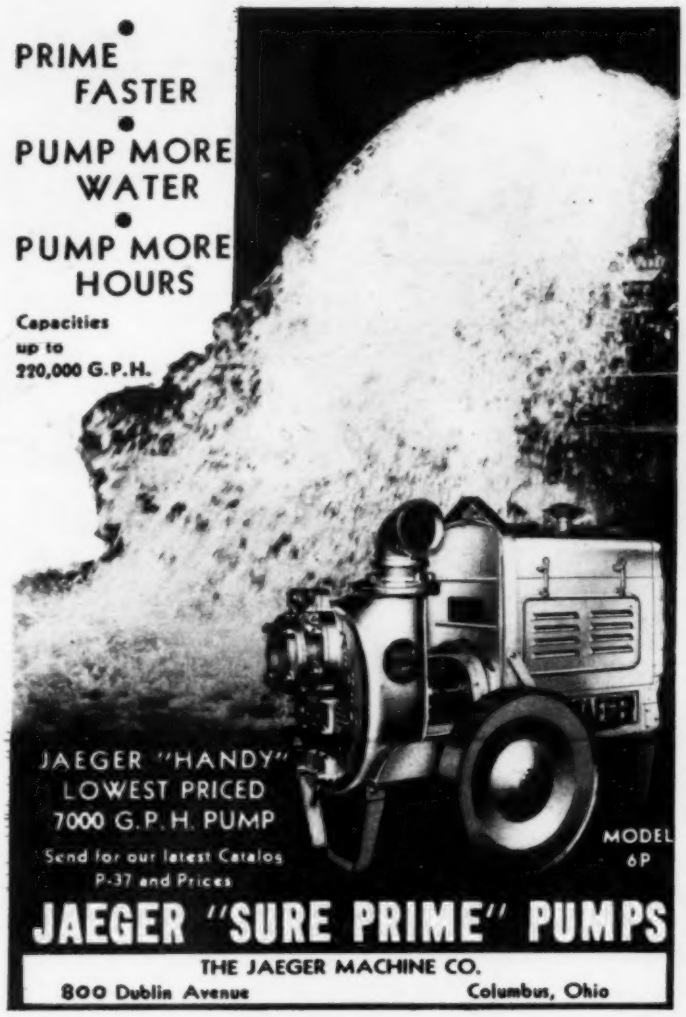
LONG-WEARING HOIST TRUNNION

FLEXIBLE DRAG CHAIN HITCH

BUCYRUS ERIE

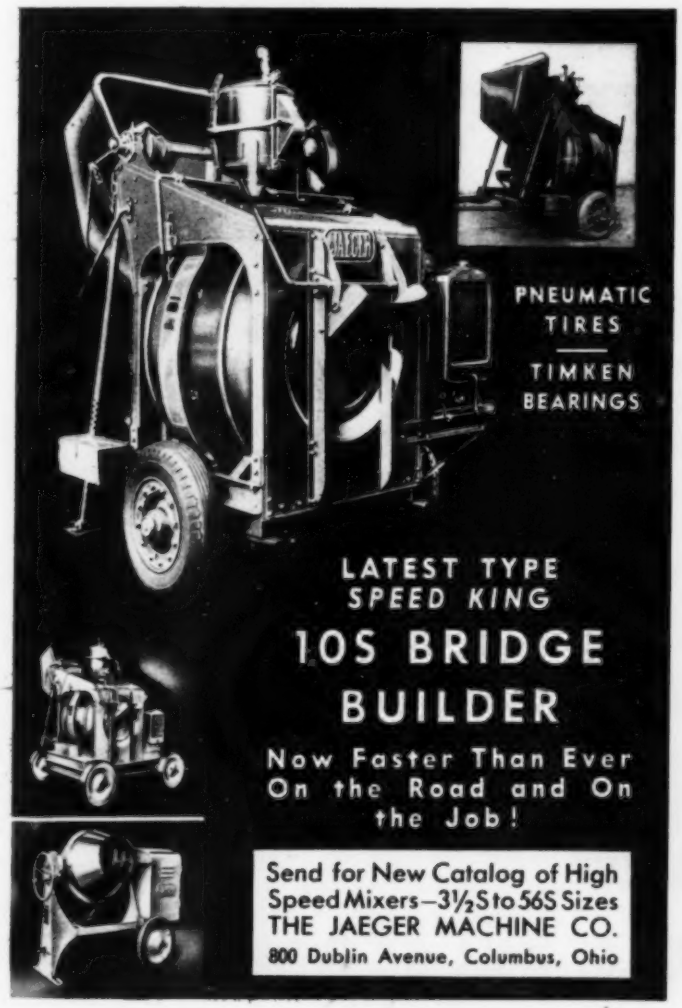
EXCAVATING, DRILLING AND MATERIAL HANDLING EQUIPMENT

SOUTH MILWAUKEE, WISCONSIN

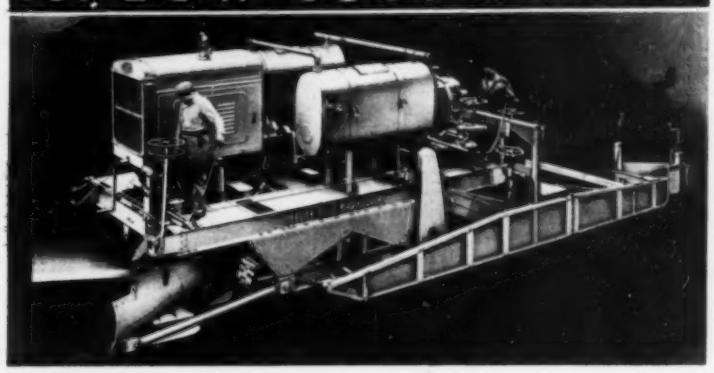

PRIME FASTER
PUMP MORE WATER
PUMP MORE HOURS
Capacities up to 220,000 G.P.H.
JAEGER "HANDY" LOWEST PRICED 7000 G.P.H. PUMP
Send for our latest Catalog P-37 and Prices
MODEL 6P

JAEGER "SURE PRIME" PUMPS

THE JAEGER MACHINE CO.
800 Dublin Avenue Columbus, Ohio


PNEUMATIC TIRES
TIMKEN BEARINGS
LATEST TYPE SPEED KING
10S BRIDGE BUILDER
Now Faster Than Ever On the Road and On the Job!
Send for New Catalog of High Speed Mixers—3½S to 56S Sizes
THE JAEGER MACHINE CO.
800 Dublin Avenue, Columbus, Ohio

The MODERN METHOD for LOW COST ROADS

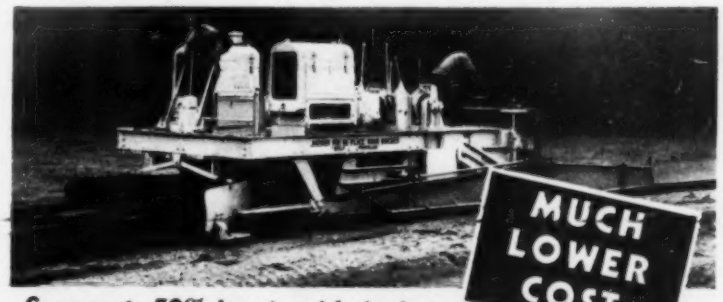


JAEGER Mix-in-Place ROAD BUILDER

Self-Propelled Mixing, Spreading and Finishing Machine for Heavy Retread and Stabilized Base

Picks up materials and passes them thru twin pugmill—gives plant mix results with a one-pass road-mix!

21 ft. straight-edge levelers equalize rough subgrade, spreading screw and screed lay a finished surface, ready for rolling—MIXED AND LAID IN ONE PASS!



Saves up to 50% investment in tractors, blades, etc., plus much lower job costs with one machine laying up to 70 cu. ft. a minute IN ONE PASS!

Also Built in Popular Priced Tractor-Drawn Model for Light Retread and Stabilization--For Full Details Send for Catalog MP-37.

THE JAEGER MACHINE CO.
800 DUBLIN AVE., COLUMBUS, OHIO

SELDOM LAID-UP *for* REPAIRS

...because they're constructed of

ALLOY NICKEL STEELS

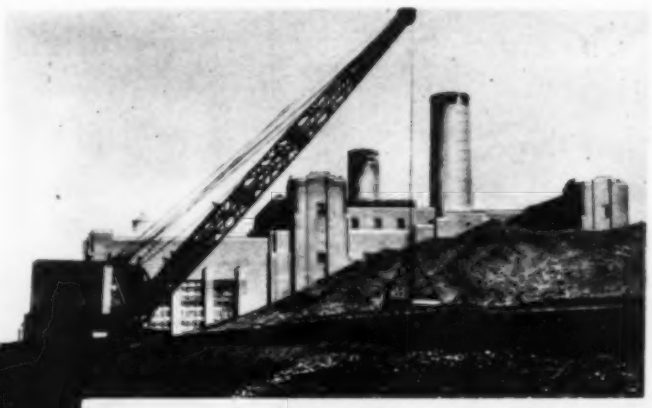
Courtesy of Marion Steam Shovel Co., Marion, Ohio.

No class of machinery tackles tougher assignments than excavating and material handling equipment such as conveyors, power shovels, cranes and drag lines.

Whether they are used for road building, foundation excavating, dam construction, surface mining or the scores of other construction jobs, they encounter high static and dynamic stresses, also heavy wear and abrasion.

Once the master mechanic and his crews worked many an hour of overtime to keep these machines in repair. But not so to-day.

Through the use of tough, strong, hard, wear-resisting Nickel Alloy Steels, leading manufacturers are turning out machines that perform dependably day in and day out with few interruptions due to breakage or excessive wear of vital parts.



Courtesy of Link-Belt Co., Chicago, Ill.

Courtesy of the Wellman Engineering Co., Cleveland, Ohio.

APPLICATIONS

of the Nickel Alloy Steels in excavating and material handling equipment

Racks, booms, sheaves
Upper and lower frames
Rollers, Large gears
Pinions and sprockets
Crawler parts
Hoist and drive gears
Hoist drum shafts
Shipper shafts
Track pins
Dipper buckets
Bucket teeth and lips

Listed at the left are some of the applications where forged and cast Nickel Alloy Steels are generally used to-day to make this type of equipment more reliable.

Consultation is invited on the use of enduring Nickel Alloy Steels in your equipment.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

HAUL YOUR HEAVY LOADS ON

SELF-LAYING STEEL RAILS

WITH

ATHEY
FORGED-TRAK
2-Way Dump Trailers

MILLIONS OF YARDS OF DIRT AND ROCK TO BE MOVED

—That's the colossal task which faces hauling units preparing the site for the new mill of the Carnegie Illinois Steel Corporation at Irvin, Pa. And that's why you'll find ATHEY FORGED TRAK 2-WAY DUMP TRAILERS on the job . . . carrying heavier loads the easiest way-over self-laying steel rails . . . making their own roads in any weather . . . dumping fast and clean either to right or left—cutting hauling costs on every trip. Dumping is positive and trouble-free—spotting the 2-Way is simple.

For work like this, nothing equals the efficiency of Athey Forged-Trak 2-Way Dump Trailers, used with "Caterpillar" Diesel Tractors. Ask your "Caterpillar" Dealer for more information—or write us.

THE *Easiest Rolling* ALL-WEATHER WHEEL

The Track Plates of the ATHEY FORGED-TRAK Wheel are made from rolled steel of ribbed design They support the rails, performing the joint function of the ties and the ballast of a railroad track

•

High Steel Rails set back from the ends of Track Plates provide a clean Wheel Rail under practically all operating conditions This minimizes friction and reduces the wear on both the Rail and the Track Wheels.

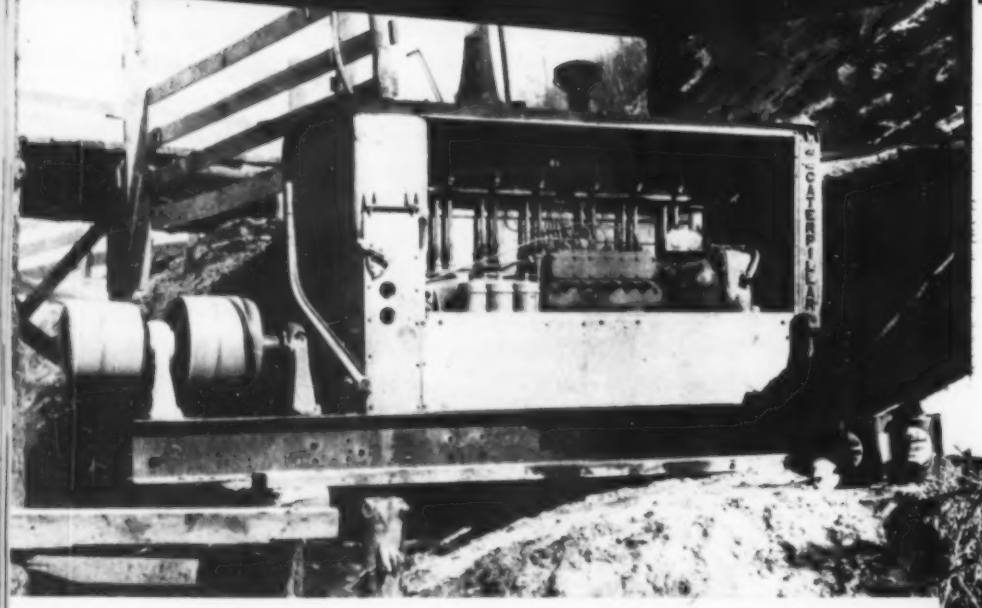
•

The Track Wheels are heat-treated for rugged strength and machined to provide a smooth rim for easy rolling over the track rails.

ATHEY TRUSS WHEEL CO.
5631 W 65th Street
Chicago, Ill.
Cable Address: "Trusswheel" Chicago

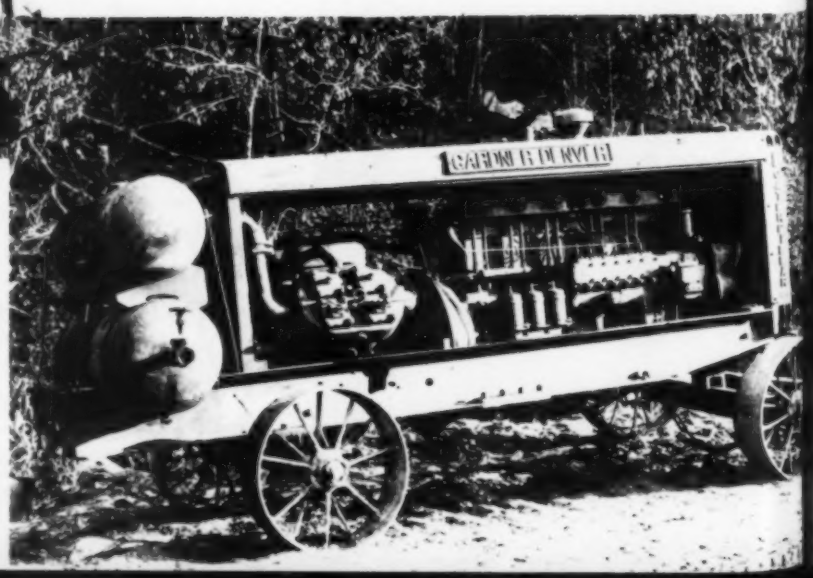
ATHEY
FORGED-TRAK
2-Way Dump Trailers
CAPACITIES 10 TO 16 YARDS

"Caterpillar" Diesel



Making highways out of hillsides. On skyline drive near Glendale Springs, N. C., "Caterpillar" Diesels are there 100%. In shovels. In compressors. In gravel-crushing plants. Pulling wagons from shovels likewise powered with Diesel. In tractors with bulldozers for spreading material. A superintendent of grading puts it mildly: "We have always found it satisfactory."

A superintendent of quarry and gravel-laying says: "We evidently think a lot of them or we would not have so many of them. All the equipment we have is 'Caterpillar' Diesel."



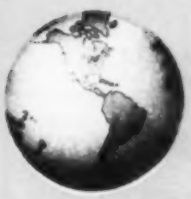
• • • STAR PERFORMER ON THE ROAD!

A good actor in any theater of operation . . . a stellar performer in the world's "road shows". . . YET it does not ask a star's "salary." No wonder this headliner gets the applause of construction engineers everywhere. As a stationary engine, as the power-plant of a shovel, as a Tarzan-of-the-Tractors, you cannot match "Caterpillar" Diesel as 100% equipment for tireless, slavish labor; for top performance at bottom cost. Mail the coupon today.

Operator of Auto Patrol says: "This machine is the best I've ever operated, and I've operated several makes of motor-graders (mentioning them by name)."

CATERPILLAR TRACTOR CO. PEORIA, ILL.

REG. U.S. PAT. OFF.



WORLD'S LARGEST MANUFACTURER OF DIESEL ENGINES, TRACK-TYPE TRACTORS AND ROAD MACHINERY

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CATERPILLAR TRACTOR CO., Peoria, Ill.

GENTLEMEN: Send me your new book, "On Construction Jobs with 'Caterpillar' Diesel Products."

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STOP TAKING HIGH OPERATING COSTS FOR GRANTED

SAVE MONEY WITH BIG LaPLANT-CHOATE RUBBER WHEELED WAGONS

19 Yard Capacity
ALSO 13 YARD SIZE

HERE'S a big, thoroughly *modern* dump wagon that will make money for you by cutting operating costs. Easy to handle and hydraulically operated by a *single lever control*, LaPlant-Choate Rubber Wheeled Wagons carry bigger loads and roll easier under all conditions. Outside hinged dump doors allow instant dumping of worst type of load. High clearance eliminates heavy drag getting off dumped load. Long, wide box assures quick, easy loading and big rubber tires cushion the load shock and strain on the wagon. Greater freedom from breakdowns and delays, less upkeep and repair costs, make these wagons dependable and economical to operate. These are but a few of the profit-making features embodied in these outstanding dump wagons. With this modern equipment, you can profitably meet competition and complete jobs regardless of weather with the speed required by today's contracts. Designed exclusively for use with "Caterpillar" track type tractors. This assures competent, readily available service from any of the hundreds of "Caterpillar" dealers throughout the country. Get full details from your nearest "Caterpillar" dealer or write direct to the manufacturer.

BULLDOZERS
BRUSH CUTTERS
SNOW PLOWS

ROADBUILDERS
SCRAPERS
TAMPING ROLLERS

LA PLANT-CHOATE MANUFACTURING CO. Inc.

CEDAR RAPIDS, IOWA.

REDUCING A MOUNTAIN

to a mill site . . . at Irwin Steel Works

LeTourneau U-12 Carryall Scrapers working in tandem behind a "Caterpillar" RD8 tractor. The lead Carryall is loaded, the rear one is in the process of loading — by loading and unloading one at a time, the tractor handles the tandem hookup with but little extra effort.

ACTUAL JOB DATA

**Results of a 2 hour and 40 minute time study . . .

Number of trips per tandem	13
Estimated load per Scraper	7½ to 8 pay yards or 15 to 16 per tandem hook-up.
Loading time, average	4 mins.
Loading distance	275 to 300 feet.
Length of haul	1300 feet, one way.
Grade	2½% favorable to haul.
Time cycle, average	12.3 mins.

To erect a huge new steel mill for Carnegie-Illinois in Allegheny County, Penna., a mountain — 3½ million cubic yards of material — has to be moved in a hurry. To the job Contractors Guthrie, Marsch & Peterson have brought the following LeTourneau equipment: 1 Angledozer, 2 Bulldozers, 3 Rooters, 2 12-Yd. Carryall Scrapers and 4 U-12 Carryall Scrapers.

In very tough going — shot rock, clay and laminated shale -- the U-12 Carryalls went to work right alongside shovels. Working in tandem behind "Caterpillar" RD8 tractors on a 1300-foot one-way haul, these rigs averaged** a complete cycle every 12.3 minutes, delivered 73 cubic yards hourly. Like Guthrie, Marsch & Peterson, many other contractors on long hauls, have found tandem operation of LeTourneau Carryalls an effective method of increasing yardage, decreasing costs. Ask your "Caterpillar" dealer how LeTourneau Carryalls, operated either singly or in tandem, can increase your earthmoving profits.

LETOURNEAU

R. G. LeTOURNEAU, INC. • Peoria, Illinois • Stockton, California • Cable Address: "BOBLETORNO"

Manufacturers of . . . ANGLEDOZERS*, BUGGIES*, BULLDOZERS, CARRYALL* SCRAPERS, CRANES, DRAG SCRAPERS, POWER CONTROL UNITS, ROOTERS*, TREEDOZERS

*Name Registered U. S. Patent Office.

Via Barber-Greenes

ON A TRIPLE INSTALLATION

THIS CONTRACTOR Standardized on Barber-Greene Standardized Belt Conveyors on three identical installations. Barber-Greene Standardization made it easy for him to select exactly the type of conveyors required for his particular job. B-G Standardization allowed "off the shelf" delivery when time was definitely money. B-G Standardization made easy quick erection, with less expensive labor, and with assurance of correct conveyor alignment. Barber-Greene Pre-Engineering guaranteed predetermined performance, thus removing one of the costly risks of contracting. When the jobs are finished, these Barber-Greenes will adapt themselves to new conditions, can be easily altered as required. You will be able to predetermine your costs more accurately if you plan on Barber-Greenes for your next job.

Write for Your Copy of the New B-G Belt Conveyor Catalog

This new 116-page book shows the full line of B-G Standardized Belt Conveyors, gives complete engineering data, has many pages of application photographs. Send a card or letter, today There is no obligation.

●

STANDARDIZED MATERIAL HANDLING MACHINES

BARBER GREENE

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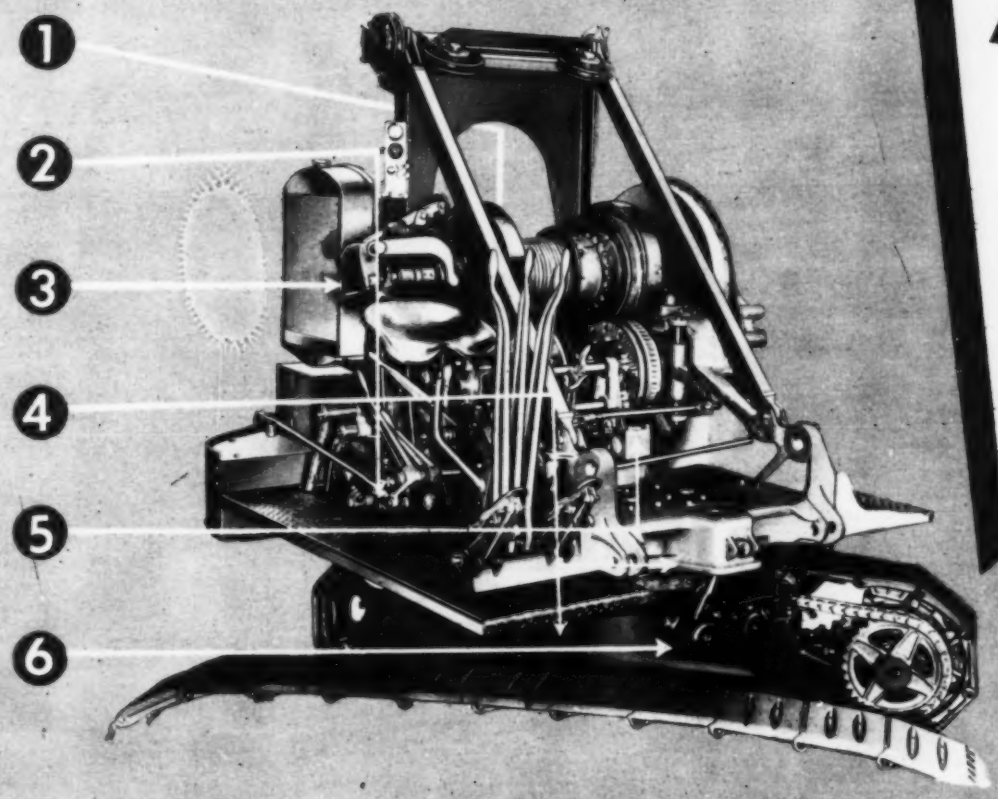
AURORA, ILLINOIS

37-16

When the costs so little more

FINEST

Why not have it!



Here is the rotating base casting of a Model 18, 1/2 yd. Northwest. Compare it with the fabricated base construction offered on many other machines.

OF course, there are cheaper 3/8, 1/2, 5/8 and 3/4 yd. machines on the market. Take off the exclusive money saving advantage that Northwest gives you in this class of equipment and it would sell at a lower price, too—*but your output and your maintenance costs would then only be equal to that of the ordinary small shovel, crane or dragline.*

Only on a Northwest can you buy all these added values—(1) the Helical gear drive; (2) the worm boom hoist; (3) the "feather-touch" clutch control; (4) cast steel rotating and travel bases; (5) uniform pressure ventilated swinging cutches; (6) adjustable hook rollers—and many more features of design that *have proved* their value for greater output.

For these advantages you pay very little over the cost of the ordinary machine.

When the *finest* costs so little more—why not have it?

A new catalog on the Northwest Model 18, 1/2 yd. machine is just off the press. *Every County Commissioner and County Engineer should have it!*

NORTHWEST ENGINEERING COMPANY
1728 Steger Building 28 E. Jackson Boulevard Chicago, Illinois

NORTHWEST

THE WORLD'S LARGEST EXCLUSIVE BUILDERS OF • SHOVELS • CRANES • DRAGLINES

Only ★ BLAW-KNOX

RENDERS THIS COMPLETE SERVICE TO READY MIX OPERATORS

Because the service is complete in all details—it is certainly most advantageous for users to purchase all of their equipment requirements for ready mixed concrete operations from one dependable source . . . . . .

BLAW-KNOX COMPANY • PITTSBURGH, PENNA.

1 TRUKMIXERS

Blaw-Knox TRUKMIXERS are the most improved design on the market today, embodying mixing efficiency; ease of operation; accurate water measurement; speedy mixing; freedom from breakdowns; low maintenance costs; long life; safety and convenience. Made in all sizes.

2 AGITATORS

Blaw-Knox AGITATORS, for hauling pre-mixed concrete, are designed to carry the maximum rated capacity of concrete for agitating with a liberal factor of safety. They are made in 1½; 2; 3; 4½; and 6 cu. yd. sizes with either separate engine drive or power take-off.

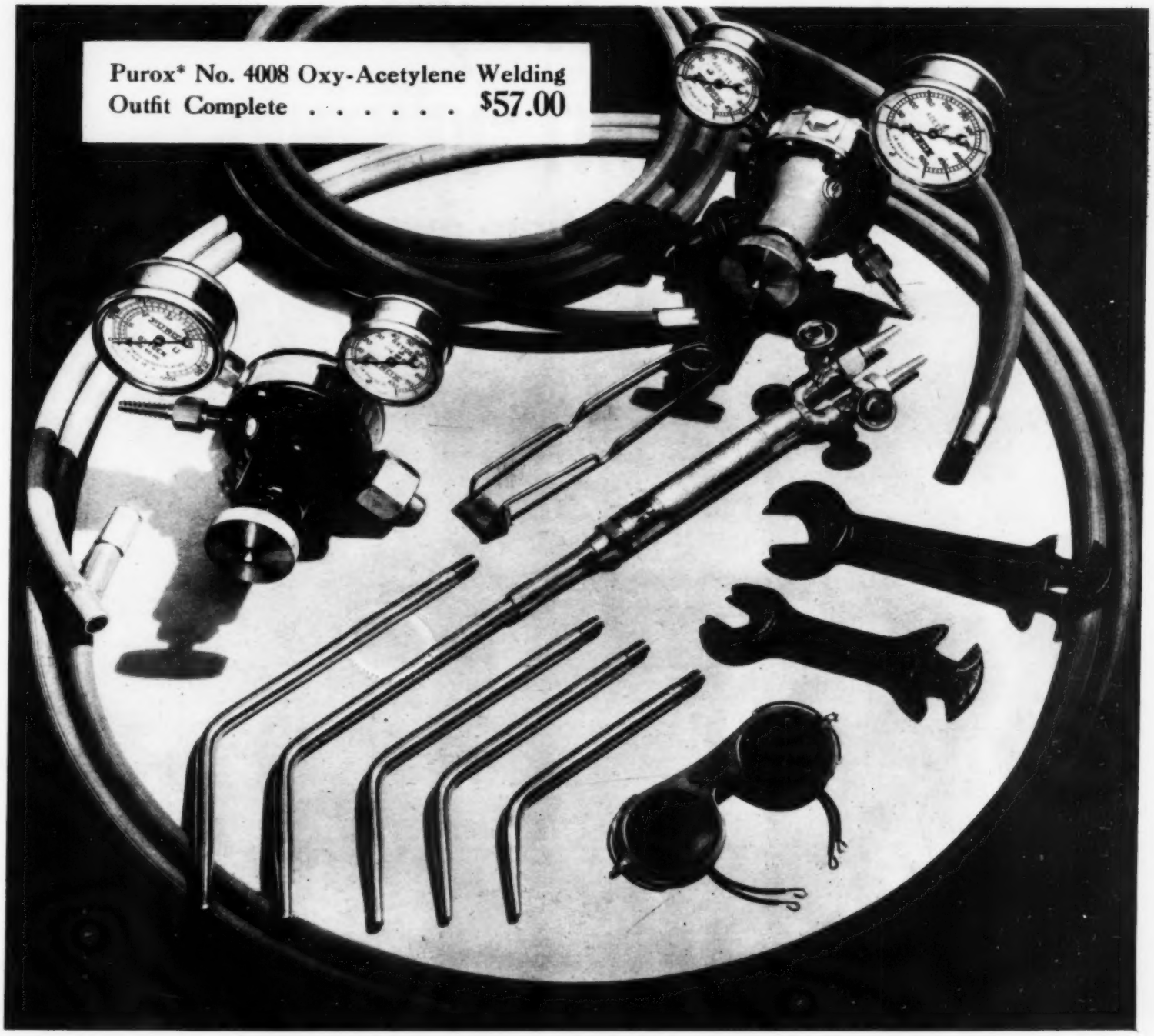
3 TRUCK MIXER LOADING PLANTS

Blaw-Knox Truck Mixer Loading Plants include conveying equipment for unloading shipments of aggregates and cement; elevating these materials into storage bins; storage bins for the aggregates and cement; manual or automatic types of batching equipment for aggregates, cement and water, and all necessary chutes and accessories for the complete plant installation.

4 READY MIXED CONCRETE PLANTS

Blaw-Knox Company designs and furnishes complete Central Mixing Plants including conveying equipment for unloading cement and aggregates and elevating into storage bins; storage bins for aggregates and cement; batching equipment for aggregates, cement and water, or manual or automatic types; and the various accessories needed for the complete plant installation.

← BLAW-KNOX CATALOG NO. 1582 Describes This Complete Service



For Profitable Welding
at Low Equipment Cost

● The low cost, sturdiness and wide adaptability of the Purox No. 4008 Outfit make it income-producing equipment for run-of-shop welding work in the light-to-medium range. Its rugged Purox regulators and efficient Purox No. 11 Torch enable you to weld metal up to a half-inch in thickness.

Ask your jobber to demonstrate how this Purox outfit gives smooth, efficient performance at low operating cost.

*Trade-Mark

THE LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation
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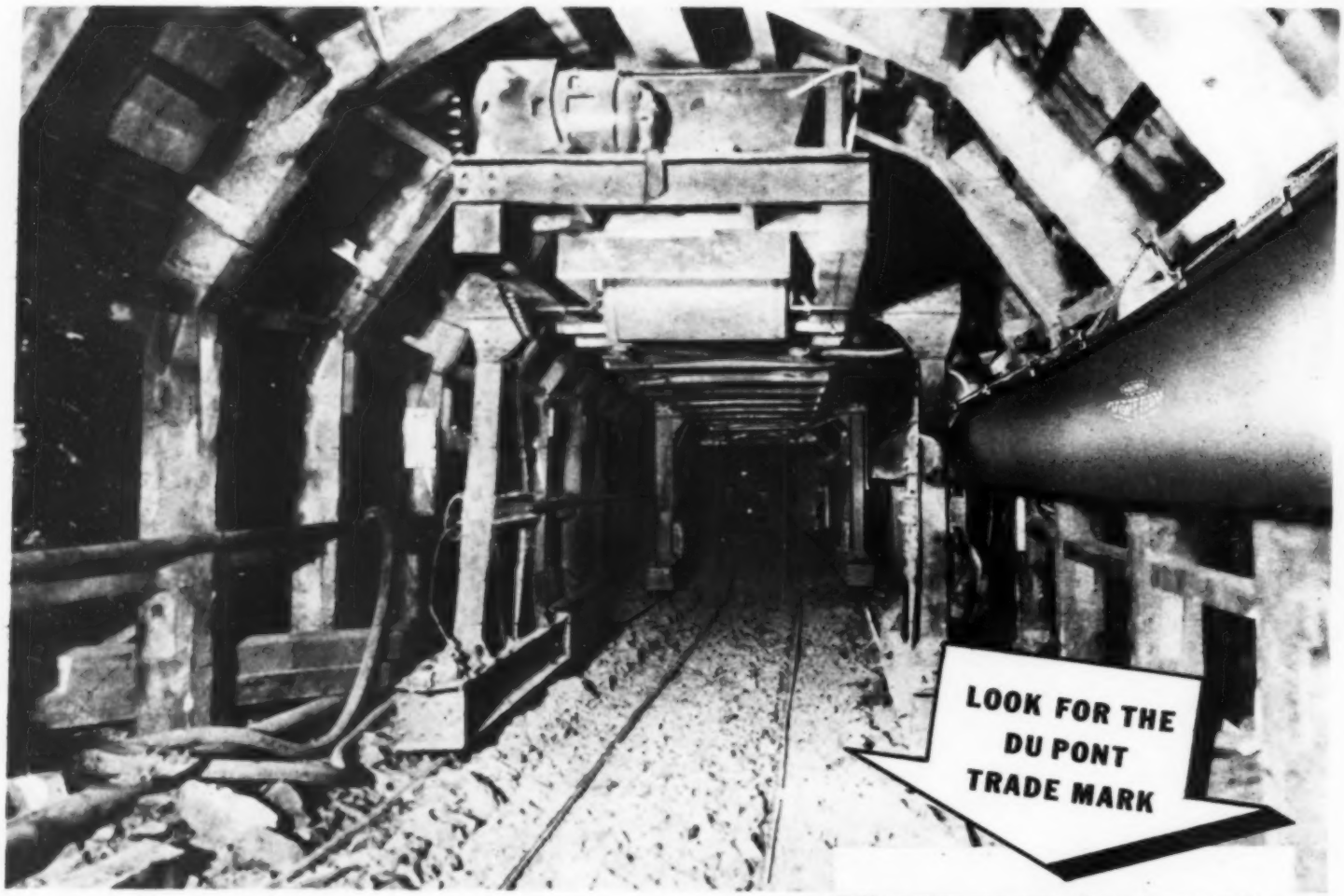
PUROX
WELDING AND CUTTING APPARATUS AND SUPPLIES

Visit the Linde Exhibit — Booth H52
National Metal Show, Atlantic City, N. J., October 18-22, 1937

When the going is tough...
use DU PONT "VENTUBE"
and save time and money!



HERE ARE but a few of the projects where "Ventube" has helped speed up work and save money: Los Angeles Water Supply project, Twin Lakes job, New York City's Delaware aqueduct, Manhattan's Sixth Avenue subway system, Fort Peck dam.

"Ventube" is an exceptionally strong, tough, and durable flexible ventilating duct. Made from extra-heavy, long-fibred Hessian cloth that is *coated and impregnated* with resistant rubber, it is highly resistant to acid water, rot and fungus. Even concussion will not rip "Ventube." It hangs fast. "Ventube" sections secure in air-tight joints in a few seconds. During blasting operations, "Ventube" slides back quickly from the working face. When work is finished, "Ventube" rolls up and can be carried to the next job.

Are you having difficulty supplying adequate fresh air to remote faces? Are your maintenance costs too high? Are your men spending too much time hanging and moving your present ventilating system? Then try "Ventube." A single trial will prove its superiority. Distributors are within quick and easy reach.

DU PONT
VENTUBE
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There's only one genuine "Ventube" flexible Ventilating Duct—and du Pont makes it. This trade mark is your assurance that you're getting real "Ventube."

E. I. DU PONT DE NEMOURS & CO., INC.
"Fabrikoid" Division, Fairfield, Connecticut

ONE OF BROOKLYN'S

LARGEST CONTRACTORS NOW 100% CUMMINS DIESEL

Turecamo, Brooklyn's largest paving contractor, now has 21 dump trucks powered by Model HB-4 Cummins Diesels. With side-boards these trucks handle 10 yards, average weight 15 to 20 tons.

With his Cummins *Dependable* Diesels, Turecamo adds an extra profit to each contract not only in fuel savings, but in lower maintenance, longer life, faster running, and better performance.

No matter what size fleet you have . . . two trucks or a hundred, the over-all economy of the Cummins *Dependable* Diesel spells extra profits. Get the facts.

CUMMINS ENGINE COMPANY
152 WILSON STREET • COLUMBUS, INDIANA

CUMMINS *Dependable* DIESEL
PIONEER IN MODERN DIESEL DEVELOPMENT

Roebling...

The pacemaker in wire rope development

THE most exacting basis for judging wire rope performance is AVERAGE SERVICE.

This is the basis advocated by Roebling, in which rope cost per ton of material handled, or per other unit of service measurement, is based not on the service of a single rope but on the *average* service of several ropes.

John A. Roebling's Sons Co., Trenton New Jersey

"It's a pleasure to operate a P&H, I really get the dirt."
D. E. Corbett.

THIS IS THE MOST ADVANCED CONSTRUCTION in the Shovel Industry —

In no other excavators will you see engineering progress carried to the extent found in these modern P&H Pacemakers. Greater strength is built in with all-welded construction of alloy steels—clumsy dead weight is stripped off to gain higher digging speeds and lower operating costs. Offered in all sizes from 3/8 to 5 cubic yards, the P&H Pacemakers are setting new records for low-cost dirt moving. For information on the size you need, address the Harnischfeger Corporation, 4494 W. National Avenue, Milwaukee, Wisconsin..

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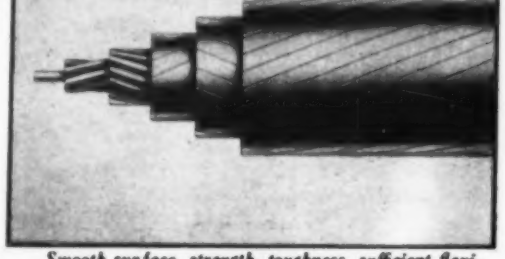
CORPORATION
EXCAVATORS • ELECTRIC CRANES • ARC WELDERS P&H HOISTS • WELDING ELECTRODES • MOTORS

TAKE THIS *Short-cut* TO LOWER HANDLING COSTS

WHEN streams, rough terrain, roads, or other obstacles make material handling expensive, difficult, or almost impossible, look to USS Aerial Wire Rope Tramways for the answer. Even in the roughest country, hauling is dependable and economical with aerial tramways. Rain, snow, mud, or ice add no problems. Access to right-of-way is usually not difficult, as all operations are generally above normal ground movements.

USS Aerial Tramways reduce hauling costs because they take the most practical means of overcoming the natural difficulties usually surrounding sources of building materials and the more isolated job locations.



Smooth surface, strength, toughness, sufficient flexibility and the Locked Coil Construction produce this ideal Tramway Track Cable.

Our engineering staff can help you speed up handling and reduce costs where ground haulage is impractical because of cost, slowness, or unnecessary re-handling. The many types of USS Aerial Tramways from which they can choose, assure a recommendation which will answer your problem. You can save time . . . avoid bad weather delays . . . and reduce your haulage costs by using this modern, efficient system.

U·S·S AERIAL WIRE ROPE TRAMWAYS

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

Construction Methods and Equipment

Established 1919 McGraw-Hill Publishing Company, Inc.

ROBERT K. TOMLIN, Editor

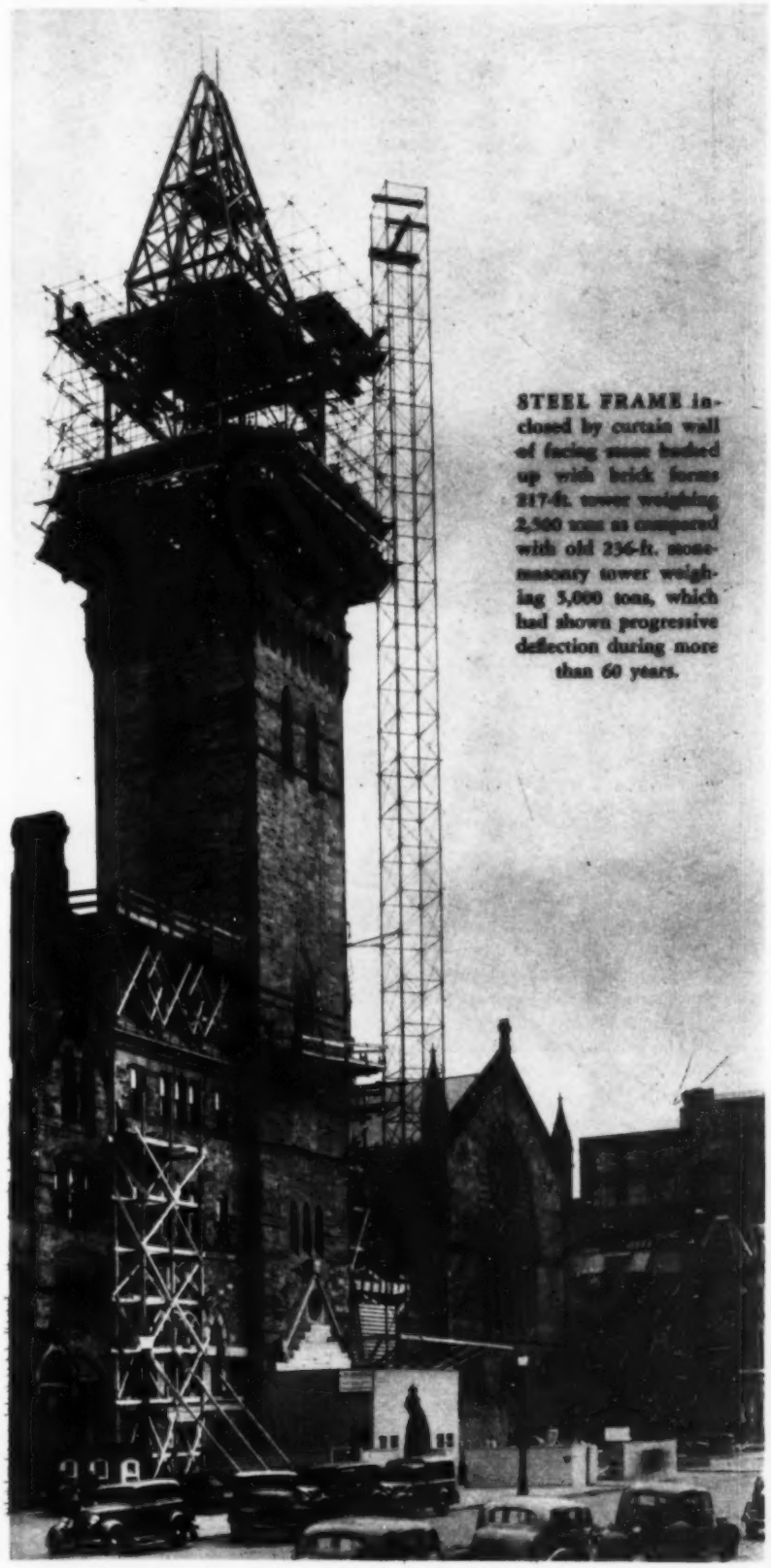
Volume 19 | **September, 1937** | Number 9

Rebuilding Church Tower With Halved Weight

PROGRESSIVE DEFLECTION of the tower of the Old South Church in Copley Square, Boston, from 8 in. in 1875 to a maximum of 3.025 ft. in 1931 interested engineers and building authorities for nearly two generations. Periods of steady increase in the tilt alternated with quiescent periods, until finally it was decided, in the interests of safety, to take down the tower from the top to the bell deck. The original tower was about 236 ft. high above the sidewalk. Built of masonry and weighing about 5,000 tons, it was supported on a granite cap resting on wooden piles driven through 7 to 10 ft. of hard clay into soft clay. The walls of the church were tied into the original tower and showed cracks as the tilting proceeded. Outside dimensions of the tower are 25x28 ft.; brownstone and limestone comprised its material.

In 1932 the tower was completely rebuilt to the height of the church roof (81.75 ft.) by the Casper Ranger Construction Co. The piling was found to be in good condition by Spencer, White & Prentis, Inc., foundation engineers, but fear that the soil might be tricky led to a design of steel framing which can be jacked up independently of the church building by the aid of slip joints placed between the church group and the tower. J. R. Worcester & Co., Boston, consulting engineers on the project, redesigned the tower structurally, using steel framing in place of masonry to cut the weight to about 2,500 tons. A new mat of reinforced concrete, 6 ft. thick, was provided, and a number of new reinforced-concrete piles driven. Last February additional funds became available through which the Turner Construction Company was employed to carry the tower upward to a final height of 217 ft. (top of finial) above the sidewalk, the top of the steel construction being 202 ft. above the walk. The tower now has a curtain wall of stone backed up by brick, but much of the former material was utilized in reconstruction, notably in the bands, ornamental courses and courses of the arches.

Material, including single stones weighing a maximum of 2,600 lb., was handled by a gasoline-driven hoist of about 2,000-lb. capacity, by double whipping the hoist for the heavier work. Staging presented a difficult problem which was solved by utilizing inverted steel trusses fabricated into the tower framing and suspending the screened-in platform from the steel members by wire cables, ratcheting the platform upward as the work advanced. Later these trusses will be burned off at the contact with the framing and the openings in the tower sides left for the trusses will be closed. Permanent staging of the spider web type was supported above the temporary construction. The tower contains four floors of used rooms, a concrete floor and roof with slate top and copper trimmings, and two steel bracing floors. Allen, Collens & Willis, Boston, are architects for the tower reconstruction.



STEEL FRAME inclosed by curtain wall of facing stone backed up with brick forms 217-ft. tower weighing 2,500 tons as compared with old 236-ft. stone-masonry tower weighing 5,000 tons, which had shown progressive deflection during more than 60 years.

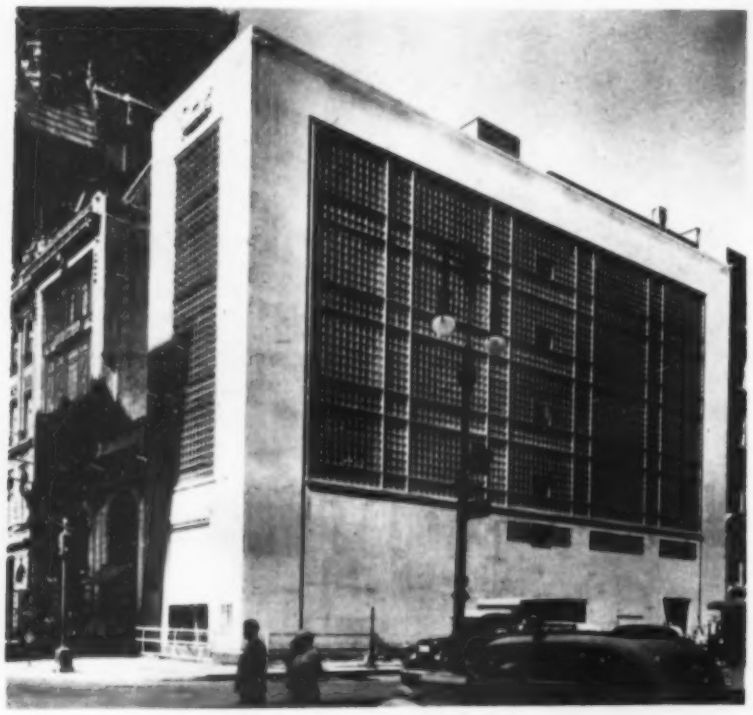
This Month's "NEWS REEL"

HIGHEST ROCKFILL DAM

ever built, San Gabriel Dam No. 1 of Los Angeles County Flood Control District, reaches final dimensions July 21 when West Slope Construction Co. places last rock in $16,860,000 structure. Rising 355 ft. above bedrock, with base width of 2,000 ft. and crest length of 1,670 ft., dam contains 10,572,000 cu.yd. of rock. Contractor placed average of 460,000 cu.yd. per month from August, 1935, to July, 1937, with maximum record of 964,566 cu.yd. in May, 1937.

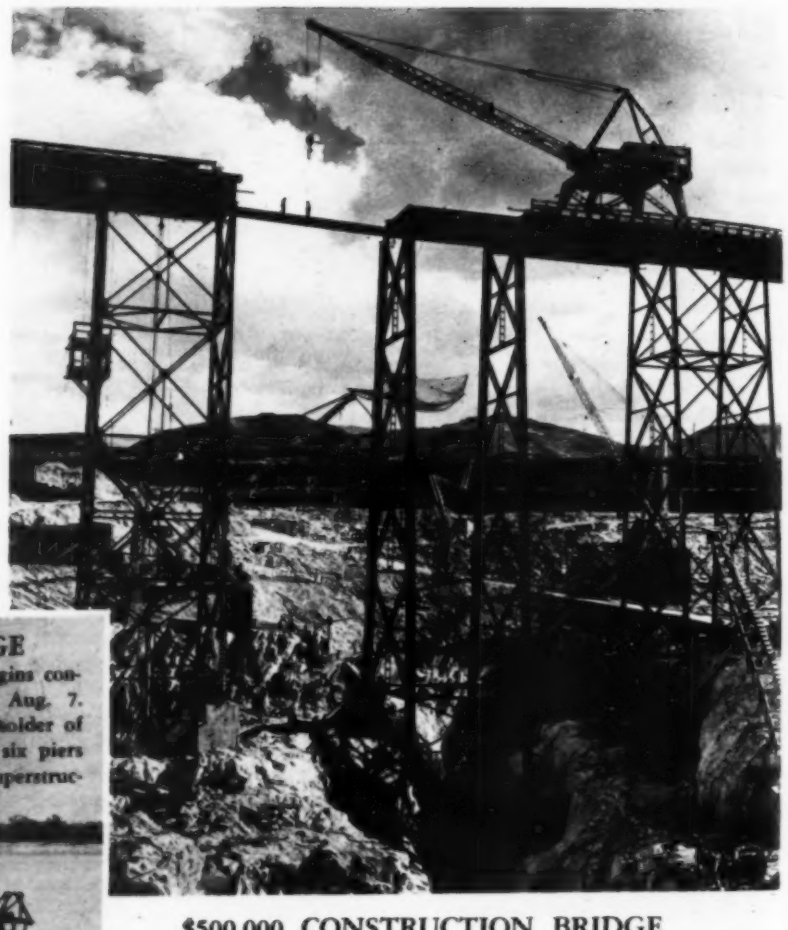
SPECIAL WOOD FORM

(left) for one of turbine draft tubes is ready to be set in place by guy derrick at Upper Salmon hydroelectric development, near Hagerman, Idaho, of Idaho Power Co. Project estimated to cost $2,400,000 is being built by company forces under general direction of H. L. Senger, chief engineer, with E. A. Woodhead serving as construction superintendent.



FIRST GLASS OFFICE BUILDING

in New York City, at corner of Fifth Ave. and 56th St., utilizes nearly 4,000 Pyrex glass blocks to form 80 per cent of exterior curtain walls, with non-corrosive nickel-copper-zinc metal alloy applied as trim. Interior partitions are glass block in panel sections, and most offices are accoustically treated with glass fiber. Two independent air-conditioning systems supply air to different parts of building, which will house offices and displays of Corning Glass Works and two subsidiary companies.



$500,000 CONSTRUCTION BRIDGE

175 ft. high and 3,000 ft. long will disappear completely in 6 months in rising mass of concrete in central section of Grand Coulee dam. Bridge carries three railroad tracks over which Mason-Walsh-Atkinson-Kier Co. will deliver trainloads of concrete from two great mixing plants, one at either side of river, under supervision of Bureau of Reclamation.

MISSISSIPPI RIVER BRIDGE

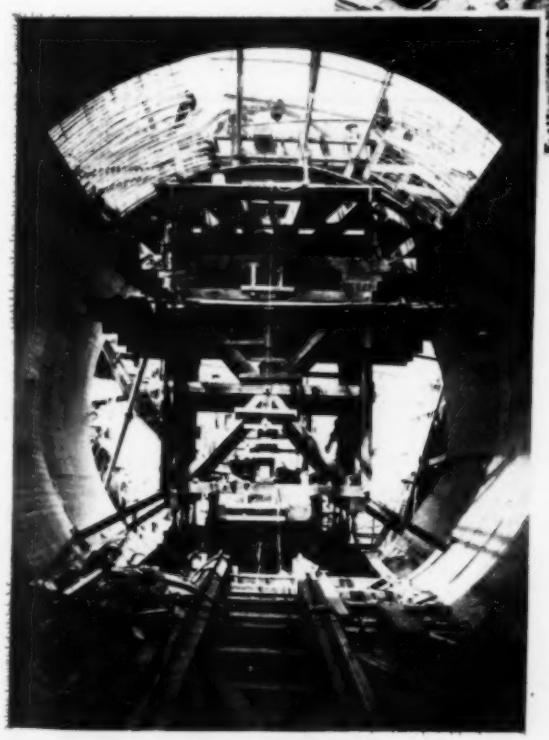
just north of Baton Rouge, La., officially begins construction operations with public ceremony Aug. 7. Kansas City Bridge Co., Kansas City, Mo., holder of $2,421,000 substructure contract, will build six piers upon which Bethlehem Steel Co. will erect superstructure under $3,705,855 contract.

TIN PLATE MILL

being erected in Birmingham, Ala., by Tennessee Coal, Iron & Railroad Co., U.S. Steel subsidiary, will be completed early next year. Virginia Bridge Co., of Birmingham, fabricates and erects steel, roofing and siding. Mill will have capacity of 200,000 gross tons of finished steel plate per year and will employ 2,500 men. New 48-in. continuous hot strip mill will furnish steel to cold reduction mill in one of buildings above.

PARKER DAM CONCRETING

starts July 31 *(left)* with placing of first bucketful *(above)* on foundation bedrock 235 ft. below river bed. Following preliminary concreting, forms are erected to receive concrete in first block Aug. 14. Dam rising 320 ft. above bedrock will create lake 50 mi. long from which 1,000 m.g.d. of water will be pumped into 392-mi. aqueduct system serving thirteen cities of Metropolitan Water District of Southern California. J. F. Shea Co. is building dam under direction of Bureau of Reclamation, acting for Metropolitan Water District.



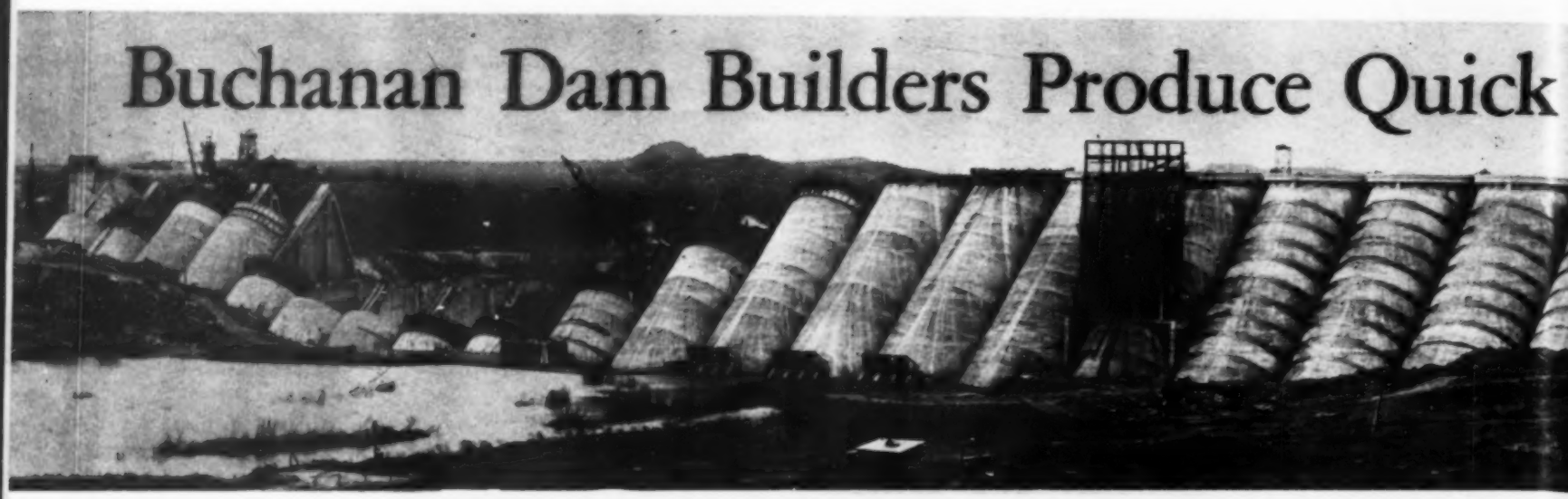
SEMINOE DAM

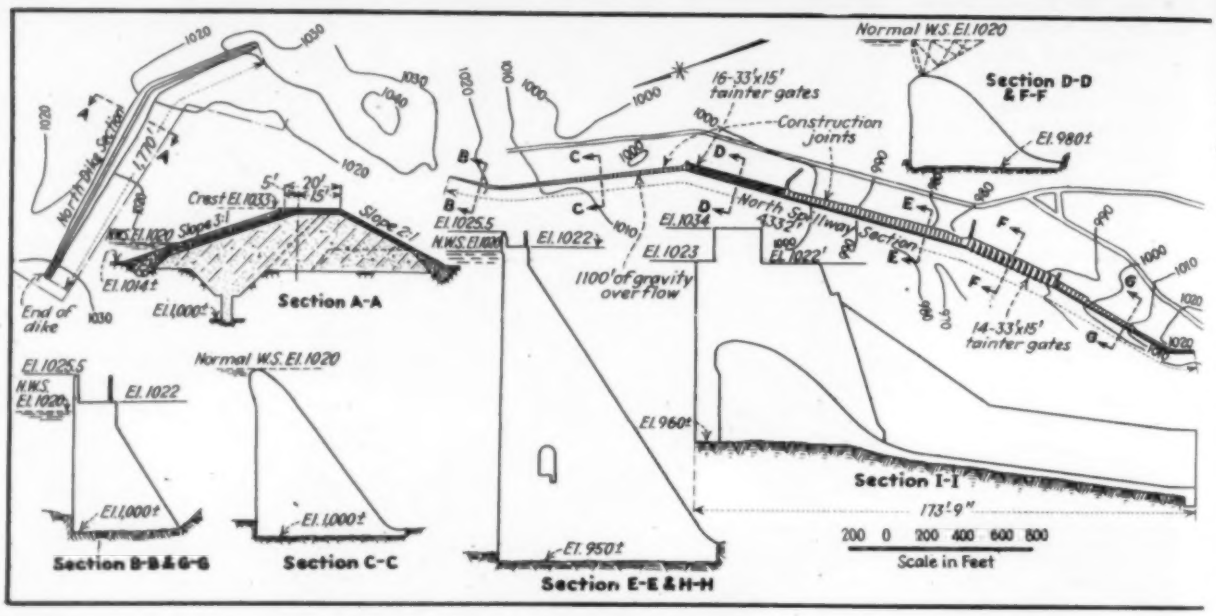
30-ft.-diameter spillway tunnel advances through 100 ft. of cut-and-cover construction with reinforced-concrete barrel being placed in three operations: invert first, then sidewalls up to quarter points of arch and finally, arch crown, for which reinforcing bars have not yet been set. After diverting North Platte River through this tunnel Aug. 10, Morrison-Knudsen, Utah Construction & Winston Bros., contractors, construct cofferdams. — *Photo from* J. H. WARNER, *resident engineer, Bureau of Reclamation, Seminoe Dam, Wyo.*

WILL ROGERS MEMORIAL HIGHWAY

running from Santa Monica, Calif., to Lake Michigan over U. S. Route 66 is dedicated with completion of final link in Santa Monica Boulevard by Governor Frank Merriam, of California, who enters finished road through old Spanish rancho gate of temporary barricade. U. S. 66 passes through Claremore, Okla., birthplace of Will Rogers.

Buchanan Dam Builders Produce Quick





CONSTRUCTION LAYOUT *(on this and facing page)* at Buchanan Dam indicates location of principal plant units employed by Lower Colorado River Authority to build series of structures stretching more than 2 mi. across Colorado River valley. Construction railroad at extreme right delivers sand from Beverly and crushed rock from crushing plant to two concrete mixing plants on downstream side of multiple 70-ft. arches. Cableway paralleling this portion of dam handles

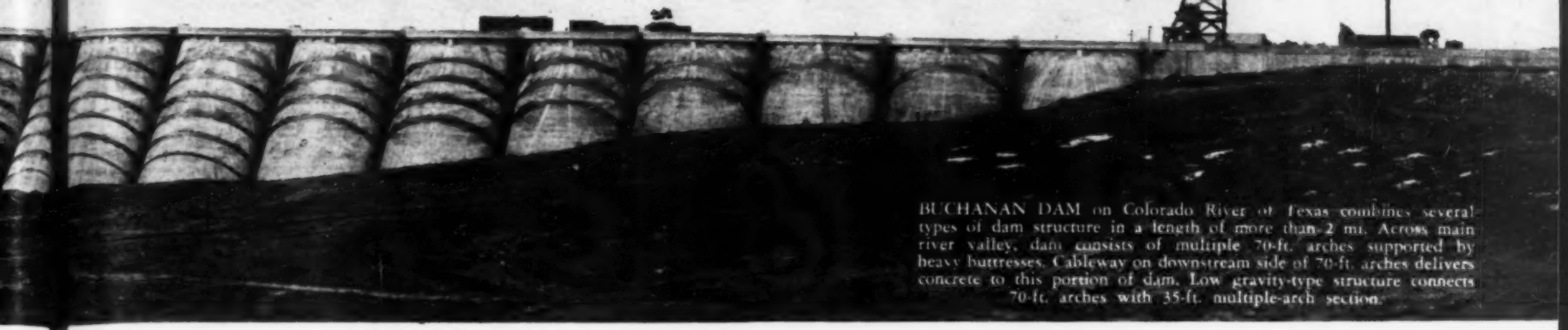
EFFECTIVE ORGANIZATION of a large construction force (aggregating at the peak 1,900 men recruited from relief rolls) produced prompt results in both progress and good workmanship on Buchanan Dam, a large flood-control and water-conservation project being completed by the Lower Colorado River Authority on the Colorado River of Texas near Burnet, Tex., about 75 mi. northwest of Austin. Embracing in its total length of more than 2 mi. a series of diverse types of dam structures, the extensive project called for varied construction operations which had to be carried on simultaneously over a wide front. The force-account organization of the Authority, staffed by competent superintendents and engineers, showed a marked ability to execute these diverse operations with satisfactory speed and a high quality of workmanship, while at the same time holding accidents and compensation costs to a low figure by means of a continuously active safety campaign.

Originally u dertaken for purposes of power development by a utility company in 1931, the project closed down one year later for lack of funds and remained dormant until July, 1936, when the Lower Colorado River Authority, a public body created by act of the Texas legislature, resumed construction as part of its program for flood control and water conservation, with incidental power development, financed by loans and grants totaling $20,000,000 from PWA. Plans for the Buchanan Dam (originally named Hamilton Dam by the power company) meantime had been revised to increase the storage capacity of the reservoir from 900,000 to 1,000,000 acre-ft., entailing an expansion of the surface area at crest level from 21,750 acres to 23,000 acres.

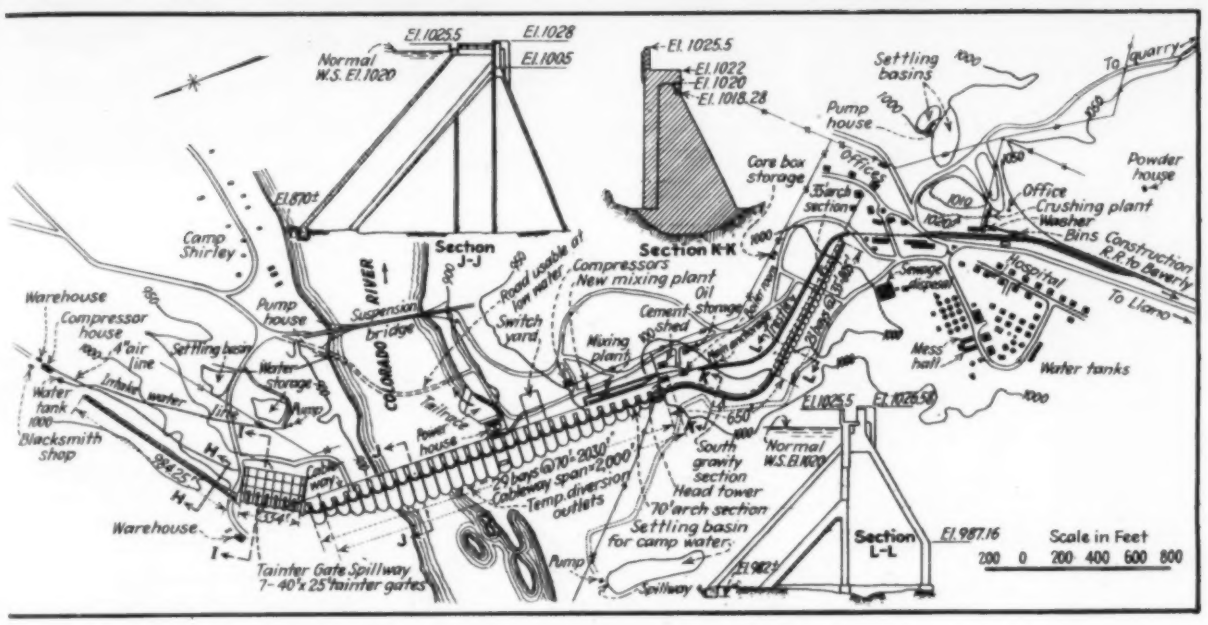
CONCRETE-WALL COFFERDAMS inclose foundations of 70-ft. arches on each side of river. Whirler cranes traveling on steel truss runways on arch buttresses handle concrete for arch construction. Concrete bucket riding under cableway carriage delivers 4-yd. loads to hoppers spotted along ground.

Elements of Dam — Concrete structures of diverse types with an aggregate length of 9,327 ft. are included in the dam, which measures 12,700 ft. from end to end. These concrete structures, strung across the river valley in a roughly L-shaped plan, comprise the following elements: a multiple-arch section with arches of 70-ft. span, a second multiple-arch section with arches of 35-ft. span, a main tainter-gate spillway section with 40x 25-ft. gates, an auxiliary spillway section embracing two tainter-gate spillways with 33x15-ft. gates, a gravity overflow section and five gravity non-overflow sections. At the north end of the dam, separated by a granite knoll from the concrete structures, is a small earth saddle dike constructed by contract simultaneously with the rest of the project during the last year. All features of the long dam are indicated

Results With Force-Account Organization



BUCHANAN DAM on Colorado River of Texas combines several types of dam structure in a length of more than 2 mi. Across main river valley, dam consists of multiple 70-ft. arches supported by heavy buttresses. Cableway on downstream side of 70-ft. arches delivers concrete to this portion of dam. Low gravity-type structure connects 70-ft. arches with 35-ft. multiple-arch section.



concrete from one mixing plant. Scale shown on two halves of this drawing is applicable only to general plan. Sections are not drawn to any uniform scale.

South gravity section (section K-K), constructed in 1931-32 by original contractor at site, is thickened and increased in height by addition of doweled concrete.

on the accompanying construction layout.

Construction Progress — Between April, 1931, and April, 1932, the Fegles Construction Co., of Minneapolis, Minn. under contract with the power company, excavated foundations and placed 66,700 cu.yd. of concrete from a plant equipped with two 1-cu.yd. mixers. Resuming construction of the project on July 1, 1936, the Lower Colorado River Authority supplemented the old mixing plant with an additional new plant containing two 2-cu.yd. mixers. Utilizing the two mixing plants, a force-account organization employing a peak payroll of 1,900 men in three 8-hr. shifts, 5 days a week, placed 182,500 cu.yd. of concrete in the 9 months from the start of work on July 1, 1936, to April 1, 1937. The organization in the same months excavated 90,000 cu.yd. of rock.

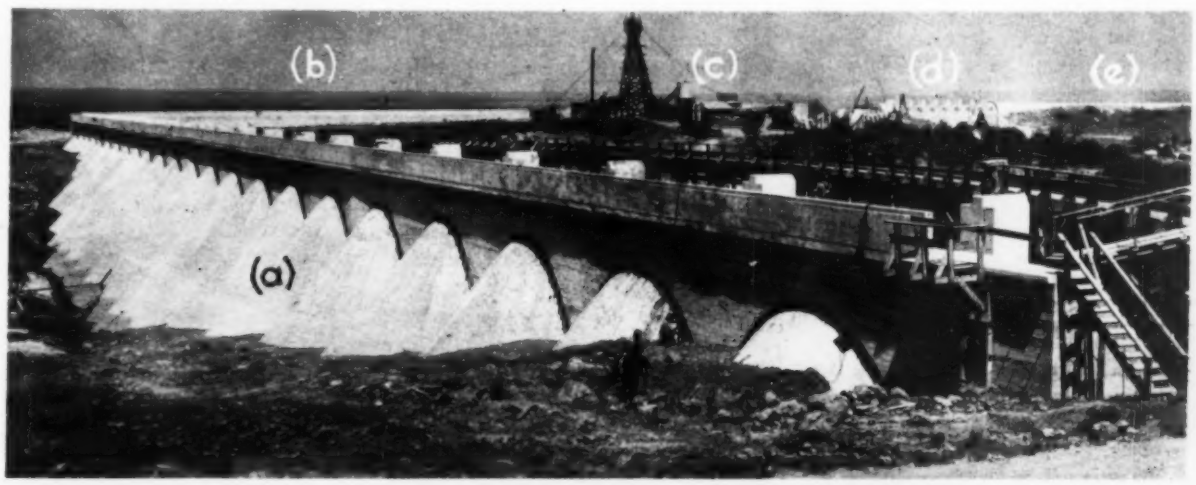
By April 1, concrete work was 93 per cent complete. The first delivery of 6,000,000 lb. of steel for tainter gates and outside structures was made April 11. In 9 months from July 1 to April 1, the total labor on the project amounted to 2,064,560 man-hr.

Foundations — Pink granite and gneiss, with some schist intrusions, form the rock foundations of the dam. The underlying rock was explored with core drills, from 2 in. to 36 in. in diameter, the latter size making a hole large enough for visual inspection by a geologist lowered on a rope.

As part of the 1931-32 construction work, the power company drilled and grouted cutoff trenches and buttresses of the multiple-arch sections of the dam. The Lower Colorado River Authority continued this grouting and, in addition, drilled a large number of grout holes along the upstream faces of these portions of the dam, as well as at other points where grouting seemed advisable. Small-diameter core drills served to put down grout holes 30 to 80 ft. deep. As an experiment, R. B. Alsop, superintendent of construction, mounted a drifter drill on a wagon-type carriage to determine whether this unit might not serve for putting down grout holes to a depth of 60 ft. Using detachable drill bits and coupled rods, the machine sank holes successfully to depths of 80 ft. in pink granite.

Hand-held hammer drills put down the blast holes for rock excavation in the area of the dam foundations. Air for these and other operations was supplied in part by small portable compressors, but the main air supply was obtained from a stationary plant equipped with three belt-driven compressors having a combined capacity in excess of 2,000 cu.ft. of free air per minute. These compressors were driven by electric motors.

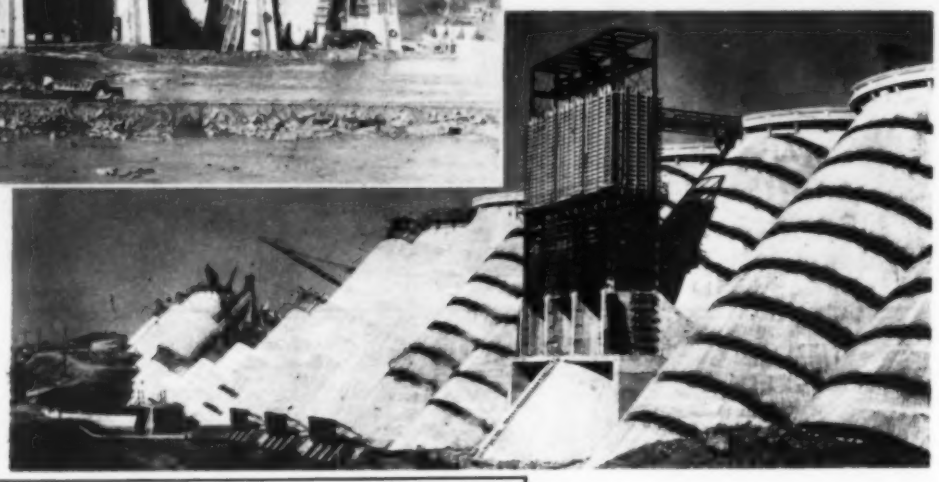
Cableway — Stretching across the main river valley on the downstream side of the multiple 70-ft. arches, a 2,000-ft. cableway delivered concrete from the old mixing plant to portable ground hoppers set at convenient locations along the route. The cableway carriage operated at a speed of 1,800 ft. per minute on a 3-in. track rope suspended between a timber head tower and timber A-frame tail tower. A stream-driven hoist engine, equipped



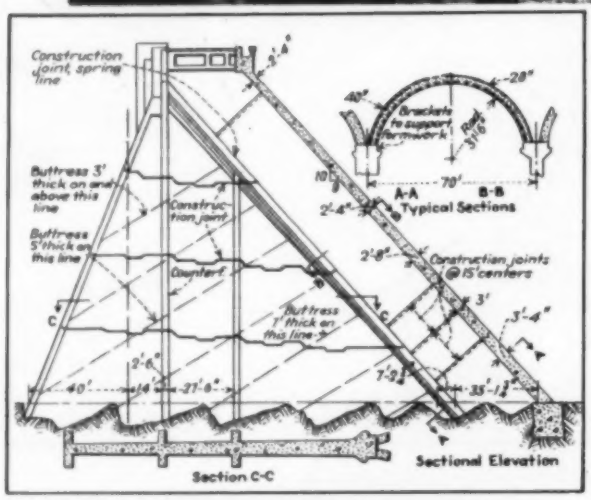
35-FT. ARCHES are sealed with bituminous waterproofing at junction between arch and vertical spandrel wall. Key: (a) 35-ft. arch section; (b) south gravity section; (c) 70-ft. arch section; (d) tainter-gate spillway; (e) north gravity section.

STEEL TRUSSES resting on arch buttresses, with timber-tower supports at mid-span, provide runway for traveling whirler cranes handling concrete from ground hoppers to arch forms.

INTAKE TOWER *(below)* with unusually large trash rack area delivers water to three 12-ft. steel-pipe penstocks. Beyond intake tower are nine temporary diversion openings equipped with flap gates for closing. Construction joints of 70-ft. arches are waterproofed with bituminous sealing compound.



STEEL ARCH FORM supported by trussed ribs serves repeated uses in concreting arch deck in successive lifts up to top of buttresses.



DETAILS OF 70-FT. ARCH indicate gradual decrease in thickness of both arch and buttress from base to top.

with a single-drum-and-gypsy combination and supplied with steam from an oil-fired boiler, operated the cableway.

Concrete was handled from the old mixing plant to the ground hoppers in 4-yd. loads transported by a 5-yd. bottom-dump bucket, equipped with horizontal-action, double-leaf gates. The old mixing plant was so located that the cableway could spot the bucket directly under the discharge spout of a hopper into which both 1-yd. mixers dumped.

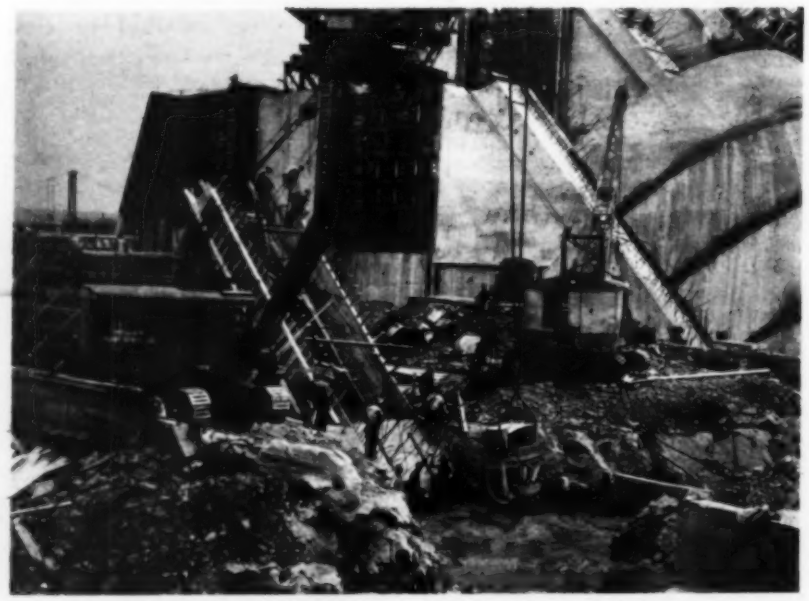
Two Mixing Plants — Aggregates were delivered by construction railroad to both concrete mixing plants. The bins of the old plant were set under a railroad tipple into which hopper-bottom and side-dump cars could discharge directly. For the second mixing plant, set up adjacent to the first, aggregates were dumped by railroad cars into bins alongside the main tipple. From a tunnel under these bins, a belt conveyor elevated the aggregates to the overhead steel bins of the new mixing plant.

Cement for both plants was delivered in bulk in railroad cars and was pumped through a pipe line equipped with a two-way valve which routed the cement either to a 375-bbl. silo in the old plant or a 500-bbl. silo in the new plant. Concrete mixtures used on the project call for three sizes of coarse aggregate: 3/16 to ¾ in., ¾ to 1½ in., and 1½ to 3 in. The three sizes of coarse aggregate were produced under contract by the Austin Bridge Co., which operated a crushing, screening and washing plant adjacent to a quarry of hard dolomite at Buchanan Dam. Sand was provided by the same contractor from a river deposit at Beverly, a distance of 5 mi. by rail from the dam. A construction railroad from Beverly to the project had been built by the power company in 1931.

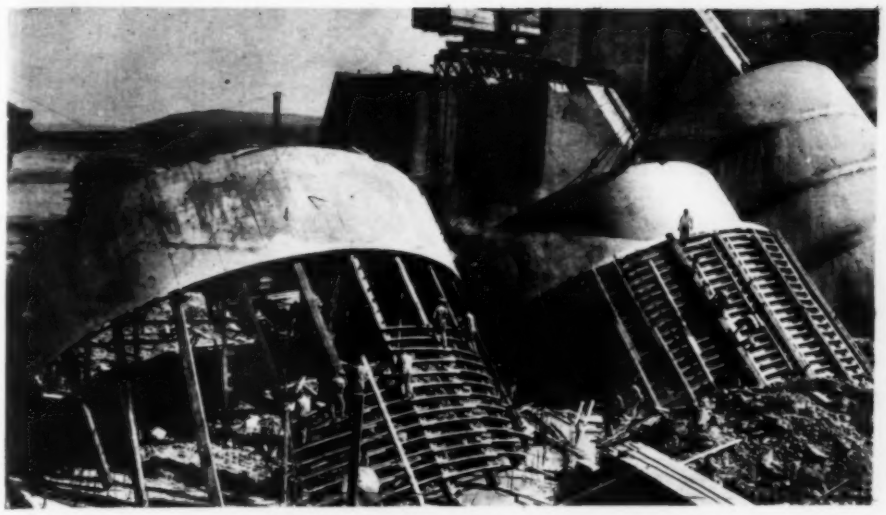
In the old mixing plant two 1-cu.yd. mixers were driven by belts from a single electric motor. Aggregates were batched by weight and water was measured by volume through a 2-in. meter valve reading to tenths of a gallon.

New Mixing Plant—Erected outside the range of the cableway, the new mixing plant was equipped with two 2-cu.yd. mixers set up over loading chutes for direct discharge into concrete buckets carried by motor trucks. From the aggregate piles over the conveyor tunnel, sand and the three sizes of crushed rock were transported to the steel bins above the mixers by a 30-in. belt rising at a 16-deg. angle, for a distance of 330 ft. between pulley centers. Dry ingredients of the mix were weighed, and water was metered by volume.

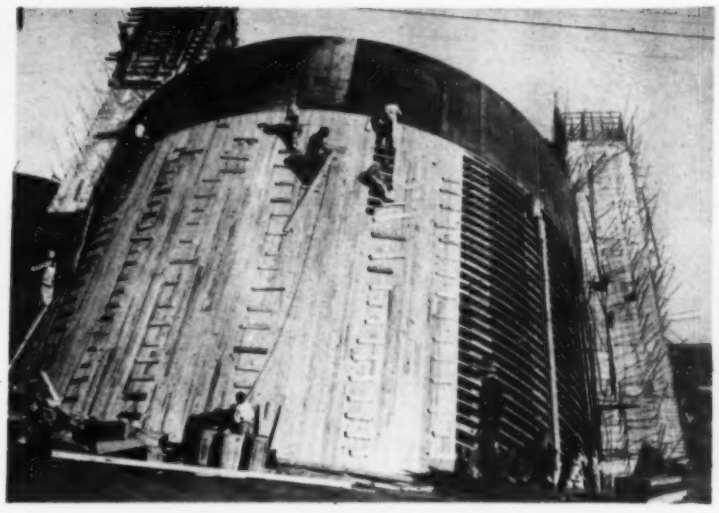
Concrete Mixtures—Original specifications written by the Lower Colorado River Authority for the guidance of its field force called for mix proportions of 1:2.45:4.75 with a cement factor of 1.27 bbl. per cu.yd. for concrete made with 3-in. maximum size aggregates. Testing and control of materials and concrete mixtures were placed under contract with Southwestern Laboratories, of San Antonio, Tex., and this organization maintained a



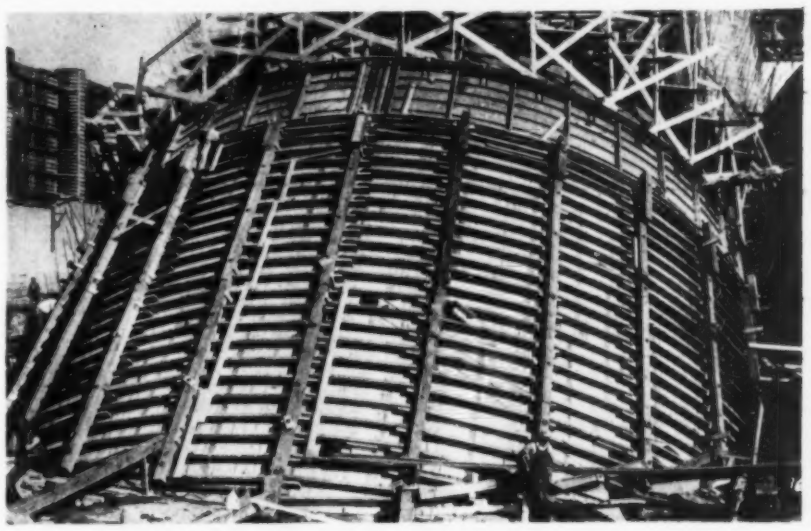
CUTOFF TRENCH under 70-ft. arches is filled with concrete by special home-made bucket designed with sled-shaped steel frame which permits buckets to be laid flat on ground for filling from trucks.



ARCH FORM CONSTRUCTION starts with proper setting of first lift of steel forms on buttresses, followed by erection of timber beams and joists to support wooden form needed for piecing out at bottom.



ON TIMBER JOISTS carpenters lay wooden form to fill out bottom of first lift.



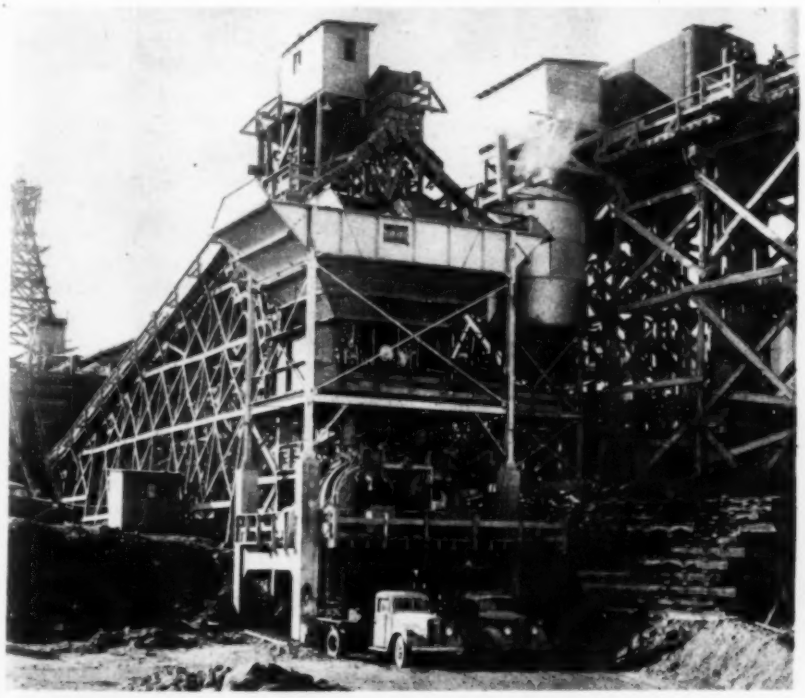
OUTER SURFACE of starter form likewise is constructed of lumber supported by timber wales held by spreader bolts at proper distance above inner form.

concrete testing and control laboratory on the job. Concrete mixtures were adjusted in accordance with results obtained in this laboratory to obtain designed density and strength with maximum economy. As an example, it was possible to reduce the cement content of concrete in the buttresses of the multiple-arch sections from the originally designed factor of 1.2 bbl. per cubic yard to 1.125 bbl. per cubic yard. With the lower cement content, test cylinders averaged 3,500 to 4,000 lb. per square inch compressive strength in 28 days.

Arch concrete contained 1.4 to 1.5 bbl. of cement per cubic yard, as well as an admixture (ranging from 2.0 to 2.5 per cent by weight of cement) of natural silica dust, to produce required density.

For mixers of 2-yd. capacity or less, the specifications required a mixing period of 1½ min. after all dry materials were in the drum. The dolomite aggregates produced concrete weighing 152 to 154 lb. per cubic foot. Wherever possible, concrete was vibrated internally with high-frequency air-driven vibrators. Concrete in the arches was consolidated by hand mauls and by riveting hammers with special heads operated against the outside of the forms.

Concrete Placing—In the 70-ft. multiple-arch section of the dam, concrete was handled from the ground hoppers into the forms by steam whirler cranes traveling on temporary steel truss bridges, spanning between special steps left in the counterforts of the buttresses. These cranes handled the concrete in special 1-yd. hopper-type buckets equipped with short discharge spouts placed at an angle of about 45 deg. with the vertical. Discharge from the spouts was controlled by radial gates. The steel trusses of the temporary runway were supported midway in each 70-ft. span by a timber tower. Two whirler cranes, of 20- and 25-ton capacity, powered by oil-fired boilers and equipped with 75-ft. booms and 15-ft. jibs, operated on these elevated runways. A third steam whirler crane of 10-ton capacity, stationed on the ground, assisted in placing concrete in the lower lifts of the 70-ft. arches.



NEW MIXING PLANT equipped with two 2-yd. mixers receives aggregates by conveyor from storage bins at one side of railroad trestle and discharges mixed batches directly into 2-yd. buckets on trucks.

In other parts of the work, concrete was handled into the forms either in 2-yd. roller-gate buckets loaded and hauled from the new mixing plant by truck or in home-made 1-yd. buckets of a special type filled from trucks at the point of placement. Two large-capacity diesel cranes fitted with 50-ft. booms and 25-ft. jibs placed concrete from the 2-yd. buckets. A smaller gasoline crane was used at times to handle the 1-yd. buckets. The special home-made buckets were designed with a steel frame shaped like sled runners to permit the bucket to be laid flat on the ground for filling from trucks and to be turned up on end for discharging through a radial-gate opening.

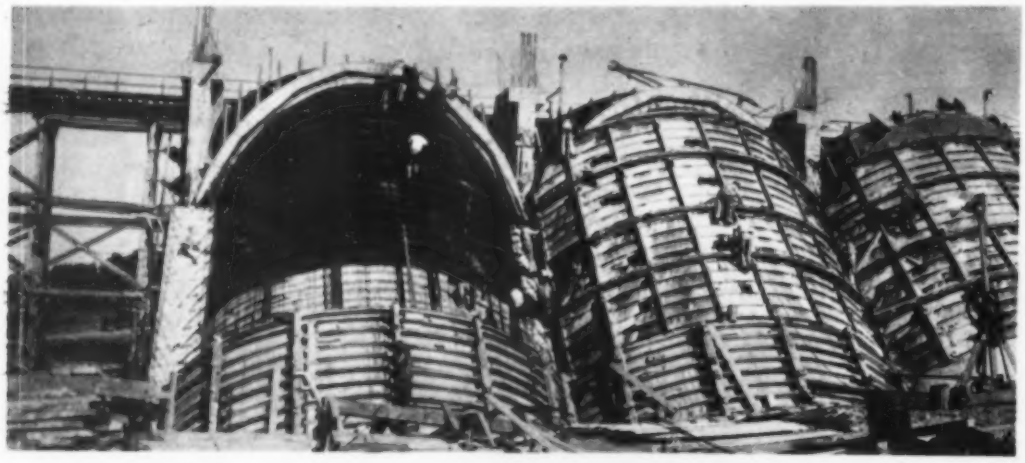
70-Ft. Arch Section—In building the main 70-ft. arch dam across the river the constructors first inclosed the south side of the channel by a concrete-wall and earthfill cofferdam. A total of nine 8x8-ft. diversion conduits was constructed in three successive arches of this portion of the dam. After the arches in this section had been carried above any possible danger from high water, the river was diverted through the conduits, and the north half of the channel was inclosed by a similar cofferdam. In addition to the temporary diversion conduits, constructed inside the limits of the first cofferdam, a pair of permanent 60-in. controllable emergency outlet valves was installed in one of the arches in the second cofferdam.

In another 70-ft. arch the dam builders installed three 12-ft. steel-pipe penstocks about 165 ft. long. One of the penstocks is bulkheaded for the present, but the other two are being connected to turbines driving 12,500-kva. generators in the power house. An intake tower with a large trash rack area was constructed, integrally with the arch, above the concrete bell mouths at the upstream end of the penstocks.

Arches vary in thickness according to their depth. For the deeper 70-ft. arches, the thickness of the arch varies from 3½ ft. at the base to 2 ft. 4 in. at the top. Supporting buttresses likewise vary in thickness from 9 ft. at the foundation to 3 ft. at the top.

Forms—Specifications required that the buttresses of the multiple-arch spans should be built ahead of the arch

as far as possible but not in excess of 40 ft. in vertical height above the top of the adjoining higher arch deck. Buttresses at the elevation of an arch lift about to be concreted had to have an age of at least 2 weeks, or sufficient time to shrink and harden thoroughly, before any concrete could be placed in the arch. To prevent undue stress in a buttress, the arch deck in any bay could not be carried more than 35 ft. in vertical height above the top of the arch deck in an adjacent bay. Forms for the 70-ft. arches were designed in 11-ft. vertical lifts, measuring 15 ft. on the slope. When the thickness of the arch did not exceed 3 ft., it ordinarily



35-FT. ARCHES are formed in entirety from ground to top with sectional steel forms pieced out with wooden forms. Steel forms are equipped with openings to permit entrance of concrete.

was sufficient in warm weather to allow concrete to set for 2 or 3 days before raising the forms for construction of the next lift.

For the construction of the 70-ft. multiple-arch sections, the concrete crews had available one complete set of steel plate buttress forms and seven steel arch form sections for 11-ft. vertical lifts of the arch decks. To top off the 70-ft. arches, the construction force had two sets of steel walkway forms and one set of steel parapet forms. The construction schedule for the 70-ft. arches was arranged to keep the buttresses rising ahead of the arches and to rotate the arch forms among the various bays in such a way as to obtain maximum production from the equipment available.

At the base of each arch, it was necessary to start form-work with a lift of wood forms which could be cut to fit foundation conditions. This starter form was extended upward far enough to permit economical repeated use of the sectional steel forms. The steel forms were made up of stiffened vertical plates supported by angle trusses with outer chords set to the proper curvature. These forms, when erected, were given the proper camber to allow for deflection under the load of concrete. The lower edge of the form was bolted to the lift previously placed, and the inner and outer surfaces of the form were held the proper distance apart at the upper edge by bolted angle spacer bars.

For the 35-ft. arches of the multiple-arch section at the south end of the dam, the constructors likewise used sectional steel forms, with wooden starter forms at the bottoms of the arches. Sufficient forms were available to form and place concrete in two arches to a vertical height of 40 ft. in one operation.

Other concrete structures on the project were built with sectional wooden forms. Altogether these forms required almost 2,000,000 b.-ft. of lumber.

Aggregate Handling — To transport

BUTTRESSES of 70-ft. arches *(left)* are braced with counterforts.

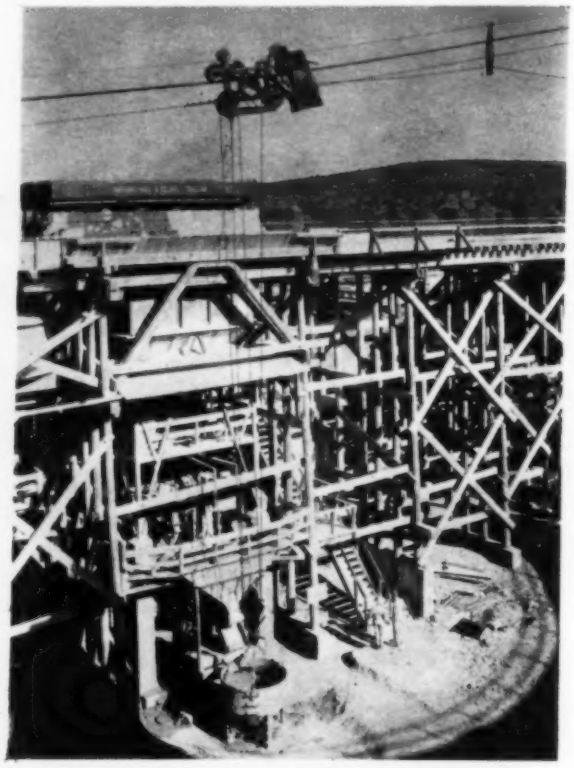
sand from Beverly and crushed rock from the crushing plant, the Lower Colorado River Authority operated a standard-gage railroad with one 70-ton steam locomotive for hauling sand from Beverly, one 20-ton steam saddle-tank locomotive for switching, and one 15-ton gasoline-electric locomotive for spotting and moving cars around the plant. Hopper-bottom 50-ton cars and air-operated side-dump 20-yd. cars were rented to haul aggregates. Two steam locomotive cranes of 25-ton capacity were used to unload materials and reclaim aggregates.

Water and Power — Drinking water for the camp was obtained from the river and was treated with a pressure filter and chlorinator before being pumped into the supply main. Electric power was brought into the site at 12,000 volts over a transmission line originally constructed by the utility concern which first undertook the project. Several miles from the site this line tapped a power line of the Texas Power & Light Co. and tied into a small hydro-electric plant acquired by the Lower Colorado River Authority along with the other properties involved in the development.

Insurance Record — By a consistent and systematic campaign of accident prevention and safety education, the Authority (which operates as a self-insurer) was able to hold its compensation insurance costs to $2.06 per $100 payroll as compared with a premium of $16.22 which would have been charged for this coverage by insurance carriers doing business in Texas. Two safety men were employed on the project for the sole purpose of spotting and eliminating hazards. A foremen's safety meeting was held at least once a month. The success of the superintendent and his assistant superintendents in impressing upon foremen the necessity of maintaining safe working conditions really was responsible for the excellent safety record established on the project.

Camp — In the construction camp at the site was a completely equipped hospital with a doctor and nurse always in attendance. The camp provided bunkhouses for 300 men, sixteen single cottages, and twenty double houses, in addition to six permanent houses which will be occupied by operators after completion of the dam. Camp buildings included a mess-hall, school, commissary and post office.

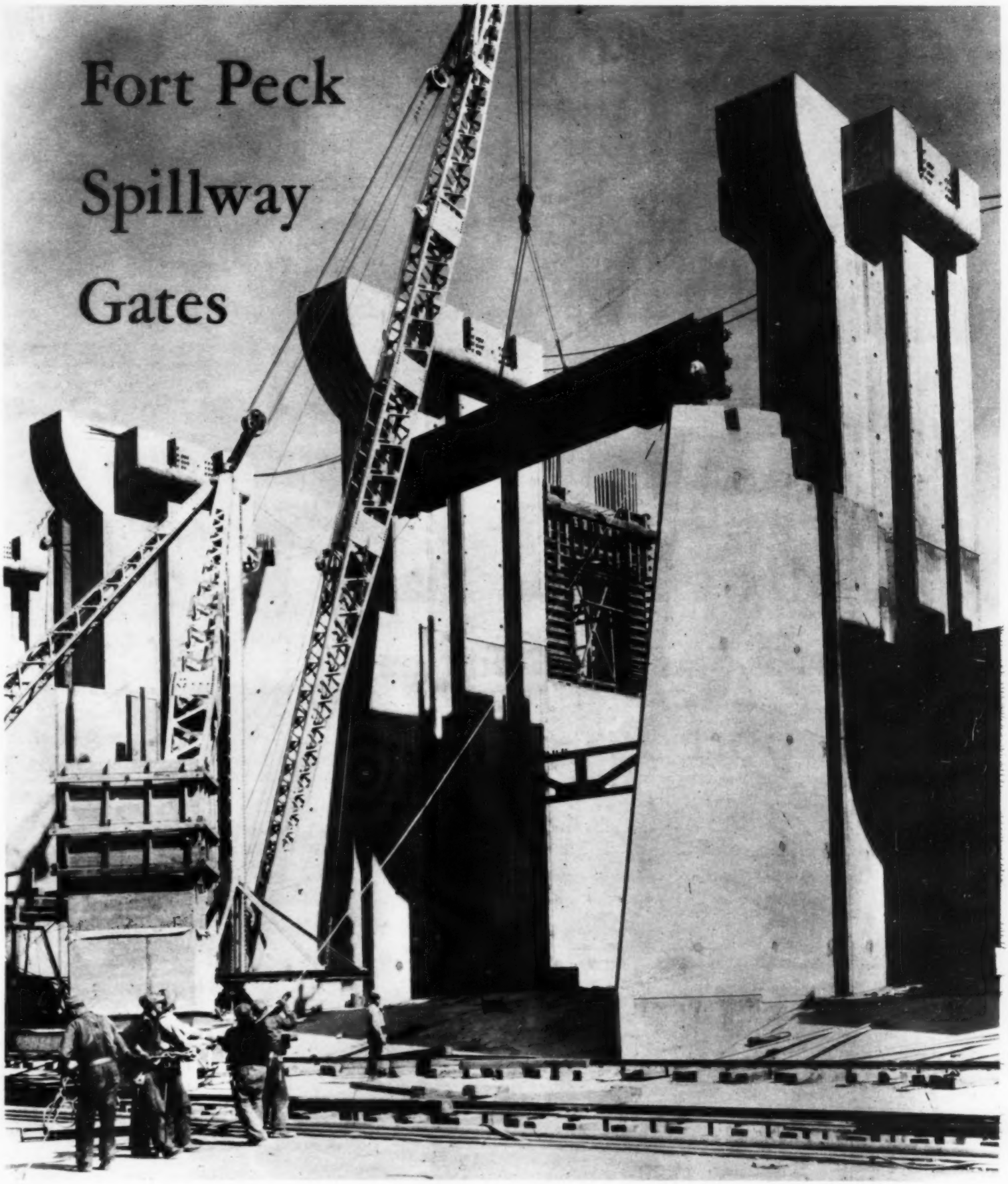
Shops — A job machine shop was equipped with lathes, planers, drill press, pipe cutting and threading machines, bolt cutting and threading machines, machines for bending, shaping and cutting sheet metal and copper, and welding outfits for both electric-arc and oxy-acetylene welding. In connection with the machine shop, on the south side of the river, the constructors maintained a blacksmith shop. A separate blacksmith shop was set up on the north side of the river. The job had a complete carpenter shop equipped with power-driven wood-working tools. All power equipment in the various shops was driven by electric motors.



TWO 1-YD. MIXERS *(above)* of old mixing plant discharge directly into bucket spotted by cableway.

Administration — Buchanan dam, one of four dams in the current construction program of the Lower Colorado River Authority, Austin, Tex., is being built by the Authority's own forces. Clarence McDonough is general manager of the Authority, R. B. Alsop is superintendent of construction in charge of all operations at Buchanan dam, and Holton Cook is resident engineer. Acting under Mr. Alsop, James Patterson is assistant superintendent in charge of work on the south side of the river, and A. C. Cerney is assistant superintendent in charge on the north side.

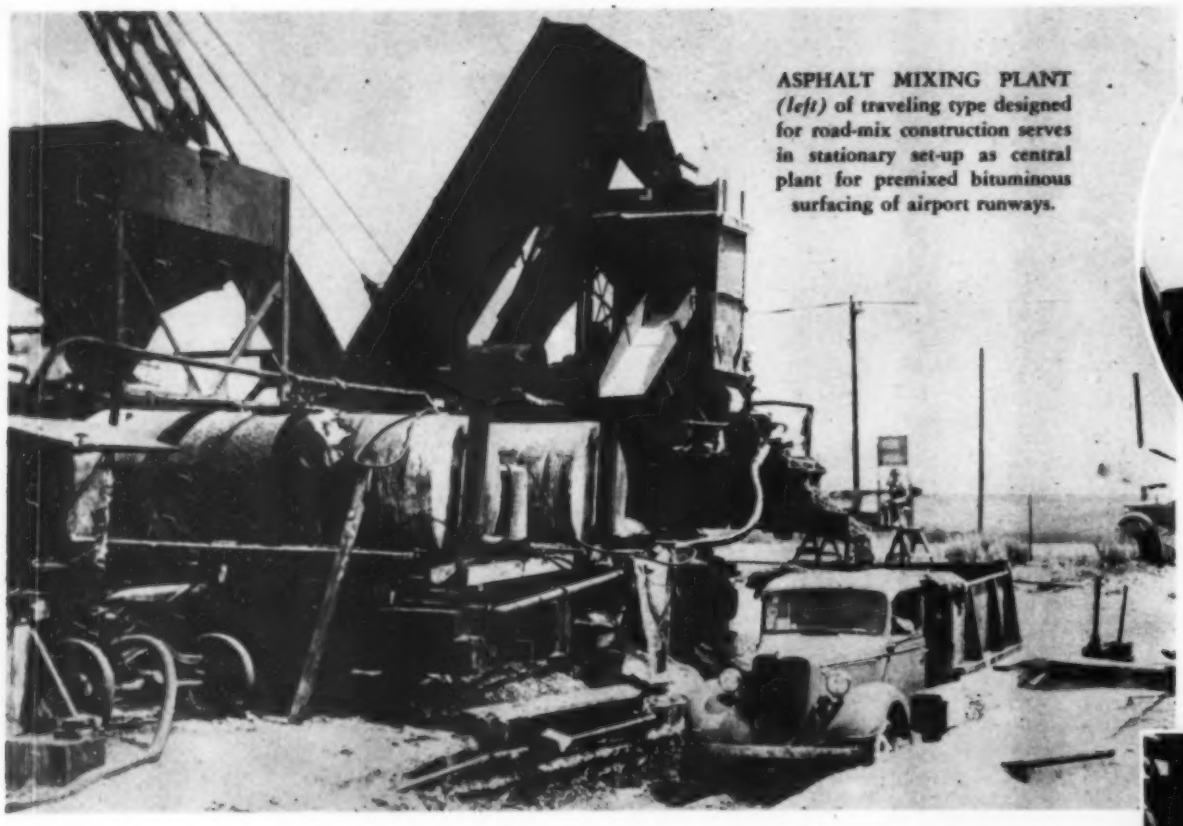
Fort Peck Spillway Gates



SIXTEEN 25x40-ft. steel Stoney gates, operating in vertical slots in massive concrete piers, control flood discharge outlet from Ft. Peck reservoir into spillway channel. These gates will regulate lake level within 25-ft. range in event great flood ever occurs to raise lake to spillway elevation. Channel, lined for 1 mi. with concrete and cut for another mile through shale, can return 254,000 sec.-ft. to Missouri River below dam.

Each spillway gate, weighing 75 tons, is assembled in four sections in vertical guides of concrete piers. Addison Miller, Inc., and Fielding & Shepley, Inc., of St. Paul, Minn., joint contractors for gate structure, raise and place 20-ton gate sections with traveling steel stiff-leg derrick running on steel rails. Separate machinery for operating each of spillway gates will consist of chain hoists located on adjacent piers and connected by drive shaft to central drive assembly placed midway on bridge between piers. Central control building is being erected on west end of bridge over tops of piers. From this station gates may be operated simultaneously, individually or in groups of four.

Gate guides are formed with hollow cores in which electric heating elements are inserted to prevent ice formation and permit operation of gates in freezing weather. Ft. Peck project is being built under direction of U. S. Engineers, Ft. Peck District, Ft. Peck, Mont. Maj. Clark Kittrell is district engineer, succeeding Col. Thomas B. Larkin.



ASPHALT MIXING PLANT *(left)* **of traveling type designed for road-mix construction serves in stationary set-up as central plant for premixed bituminous surfacing of airport runways.**

SUPERVISING CONSTRUCTION of 295,000 sq.yd. of asphalt runways at Chicago Municipal Airport, ARTHUR HAINES, WPA superintendent, directs activities of 1,400 to 2,000 workmen.

Road-Mix Asphalt Plant

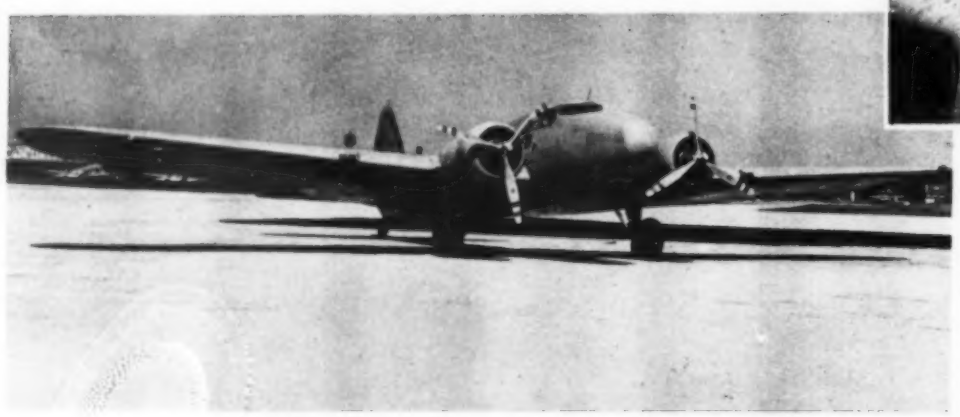
Functions as Stationary Unit on Airport Project

By

ARTHUR HAINES

Superintendent, Works Progress Administration

TWIN PUGMILL MIXER of central plant discharges directly into truck which drives into slight depression under chute.



LARGE TRANSPORT PLANE, typical of craft using airport, taxies across 610-ft. paved circle after landing on one of four runways which intersect at this point.

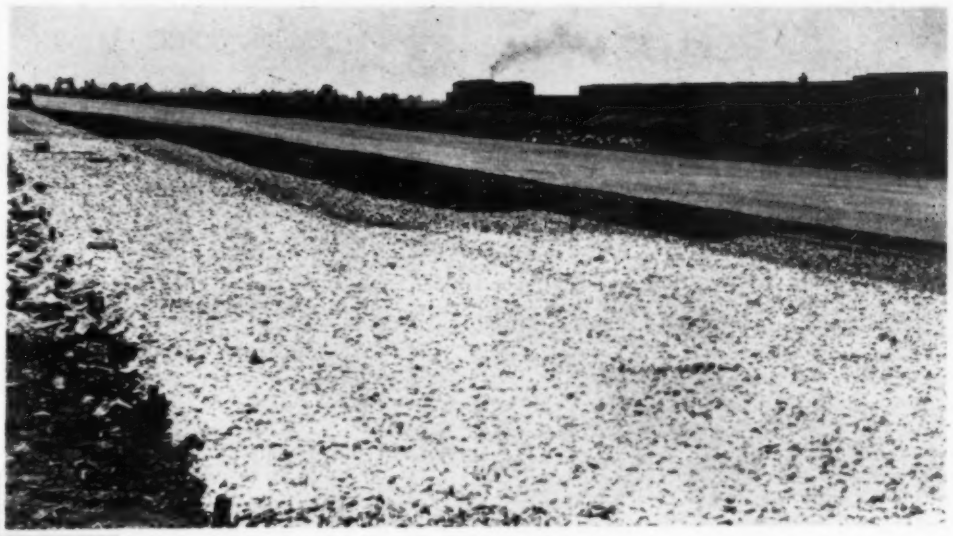
HAND LABOR *(left)* **in large numbers is used to excavate subgrade for runways 175 ft. in width.**

TO IMPROVE the runways of the Chicago Municipal Airport, one of the largest and busiest airports in the United States, the Works Progress Administration, in conjunction with the City of Chicago Bureau of Small Parks, Recreation & Aviation, made an appropriation of funds and started construction of adequate pavement on all runways December 16, 1935. About 100 transport planes, some of the larger types weighing 12 tons, arrive and depart at this airport every 24 hr.

Runway Construction—Runways are 175 ft. wide, and one is 4,460 ft. long. On the west end of the airport six radial runways converge into a circle 610 ft. in diameter. The total yardage of all runways to be surfaced was about 295,000 sq.yd., the equivalent of 25 mi. of 20-ft. roadway.

Because of the weight and number of planes using the airport, with even heavier traffic expected in the future, a heavy type of surfacing was used. This surfacing is composed of a 12-in. base course, a 3-in. intermediate course penetrated with asphaltic oil, and a 2-in. premixed bituminous top followed by a light seal coat of asphaltic oil and stone chips.

Contracts — Two contracts were let by competitive bidding, one for furnishing asphalt and a traveling plant to produce the material for the 2-in. bituminous surface, awarded to S. G. Hayes & Co., Chicago, and the other for furnishing and applying asphalt to the intermediate course and seal coat, awarded to the Nelson Distributing Co., Lockport, Ill. Although the first of these contracts called for a traveling plant which would operate on the runways, because of the heavy traffic of the airport and the hazard of having the plant on the landing field, it was decided to set up this unit as a stationary central plant and haul the finished mix to the runways by trucks.



FOUR STAGES of runway construction *(right)*. In foreground is white stone of 12-in. base course, adjacent gray strip is intermediate course, black material is top course, and smooth gray surface beyond is finished top after rolling.

TOP COURSE is compacted by 10-ton roller.

Paving — More than 7½ mi. of tile was laid to drain the subgrade thoroughly. These drains were connected into the Chicago sewer system. Runways then were excavated to the necessary depth for the surfacing courses, and the subgrade was rolled.

A base averaging 12 in. thick, composed of broken concrete, brick, and cinders, was spread and rolled to final compaction by 10-ton three-wheel rollers. Some of this base material was spoil from other WPA projects, from PWA contracts and from operations of general building and paving contractors in the Chicago area.

For the intermediate course the design called for crushed stone graded from 2½ to 1½ in. and rolled with 10-ton three-wheel rollers to a compacted thickness of 3 in. The course was penetrated with 1½ gal. of asphalt per square yard, using a self-propelled bituminous distributor of the pressure type.

Asphalt Mixing Plant — A Barber-Greene heavy-duty traveling plant was set up as a stationary central plant, slightly elevated and blocked with heavy timbers. A runway was excavated to permit the finished mix to discharge from the twin pug mill directly into the trucks.

Essentially, the plant consisted of an elevating loader and a twin pug mill. Aggregate was fed by spiral feeder to a bucket elevator which raised and dumped it into a hopper. Aggregate from this hopper was accurately proportioned by an apron feeder, and the bitumen was measured by a metering pump, with both drives interlocked to the same drive so that when set for a satisfactory mix the operation was automatic. To feed the stationary plant, aggregate was placed in an elevated hopper equipped with a slide gate. This gate was regulated to furnish a constant flow of material to the spiral feeder of the plant. A crane filled the elevated hopper from ground storage.

Finished mix was hauled to the runways by trucks, spread with a spreader box, raked to line and grade and rolled to 2-in. compacted thickness by a 10-ton three-wheel roller. The mix was composed of crushed stone graded from 1-in. to 200-mesh, with little material passing the 200-mesh screen, and 17 gal. of asphalt per cubic yard of aggregate.

For the seal coat, ⅓ gal. per square yard of asphaltic oil then was applied to the last course by a bituminous distributor and blotted with approximately 25 lb. per square yard of stone chips. The seal coat was rolled to key the chips. A combined curb and gutter was constructed on both sides of the runways to protect the edges and for drainage purposes.

All work was conducted in such a manner that regular plane traffic was not disrupted and the traveling public was subjected to no hazard. On all operations, except mixing, construction was planned to use the maximum of hand labor. All equipment except that used by the contractors was owned or hired by WPA. Relief men assigned to the project by WPA varied from 1,400 to 2,000. The number was gaged according to the need. Engineering supervision and inspection were under the jurisdiction of WPA engineers and supervisors.

Finished Runways—Pilots who regularly use this airport speak highly of the smooth and resilient finished runways. The texture of the surface is such that there is no tendency of the planes to skid, and this feature is a valuable aid to the pilots in handling the heavy transport planes. At present some of the construction work at the airport remains unfinished, but it is expected that the present program will be completed this year.

WOODEN SPREADER BOX spreads top material on intermediate course.

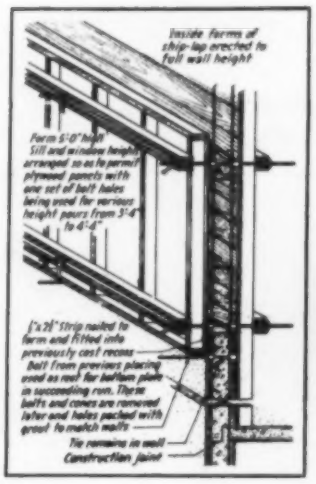
TRUCK DISCHARGES PREMIXED MATERIAL *(right)* into spreader box before drawing spreader ahead.

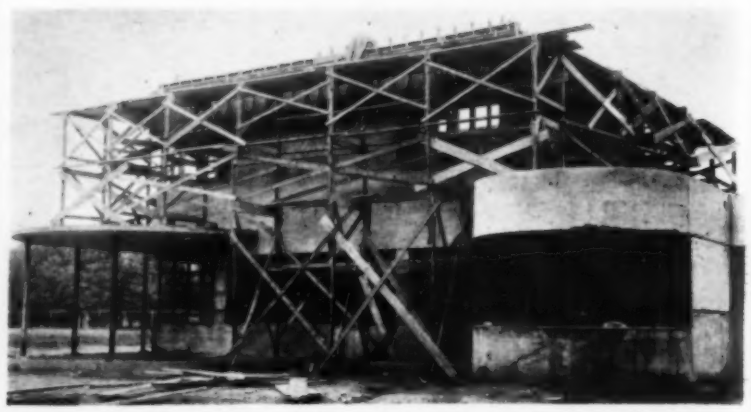
Latest Developments in Building CONCRETE HOUSES

By A. L. REHNQUIST

Portland Cement Association, Chicago, Ill.

Excerpts from paper presented at National Conference of Concrete Contractors


Inside forms of ship-lap erected to full wall height
Form 5'-0" high
Sill and window heights arranged so as to permit plywood panels with one set of bolt holes being used for various height pours from 3'-4" to 4'-4"
1"x2½" Strip nailed to form and fitted into previously cast recess
Bolt from previous placing used as rod for bottom plate in succeeding run. These bolts and cones are removed later and holes packed with grout to match walls
Tie remains in wall
Construction joint



LIFT FORM ON OUTSIDE and story-height form on inside build concrete walls of Forsythe house, Tulsa, Okla. FORM DETAIL *(left)* indicates method of bolting outside form in position for each lift.

Form Costs (Per Sq. Ft.) for Solid Walls
USING PANEL FORMS STORY HIGH AND IN LIFTS

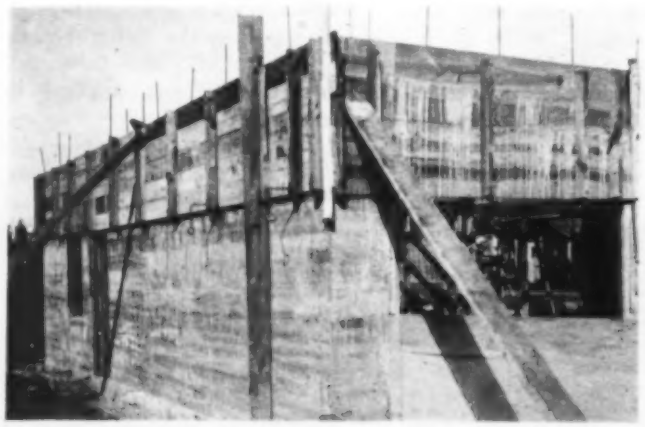
	STORY-HIGH METHOD	LIFT-FORM METHOD	
		Reuses Doubled	*Reuses Tripled*
DEPRECIATION	2.00c.	2.00c.	2.00c.
FORM TIES	1.25	1.25	1.25
LABOR—oiling, setting, leveling, aligning, removing and cleaning	5.50	5.50	5.50
HAULING AND HANDLING FORMS TO AND FROM JOB	2.00	1.00	.67
TOTAL COST OF FORMS	10.75c.	9.75c.	9.42c.

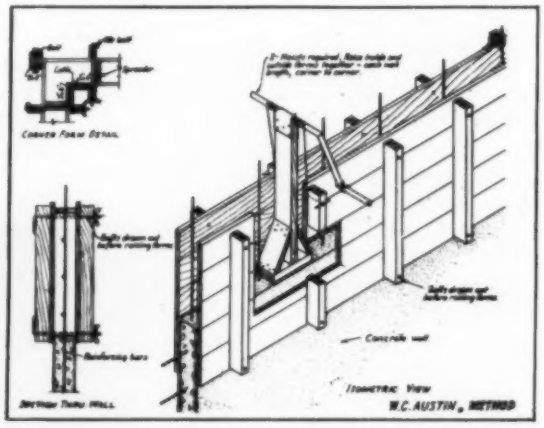
By comparing costs for the two forming methods as shown in the table, it is seen that a sizeable saving can be made in the item of hauling and handling of the decreased number of forms using the lift-form method. No doubt there is actually a saving with the increased number of reuses also, but as it is difficult to arrive at, the saving is not shown. The important saving, however, is the reduction of one-half to two-thirds of investment required for forms.

W. C. Austin, a concrete house builder in Lawton, Okla., built the house illustrated herewith, using a wood lift form of his own invention. He builds an ordinary wood form of matched boards and 2x4's one-third story height, around the perimeter of

With BUILDING staging a comback, many materials and combinations of materials are being advocated for residential construction. Monolithic reinforced concrete promises to be among the leaders in the field. Every contractor and builder can figure the cost of concrete and steel, but the variable quantity seems to be the cost of forming. The majority of contractors seem to have the tendency to select a method of constructing home walls so as to place the concrete in story heights requiring enough forms to form story high at one time. Sometimes this method calls for a larger investment than a contractor feels he can afford. Therefore, if a method of forming were adopted where the form reuses were doubled or tripled by using only one-half to one-third the number of forms required for story height, the original investment would be cut one-half to two-thirds. This can be done by constructing walls in lifts, using various types of panel forms.

The table shown above gives actual costs of the story-high method and estimated costs for lift-form method, both using panel forms. The story-high figures are average costs obtained from construction data on the Purdue house at Lafayette, Indiana.





LIFT FORMS designed for full wall lengths are set in position for final pour of story-height walls.

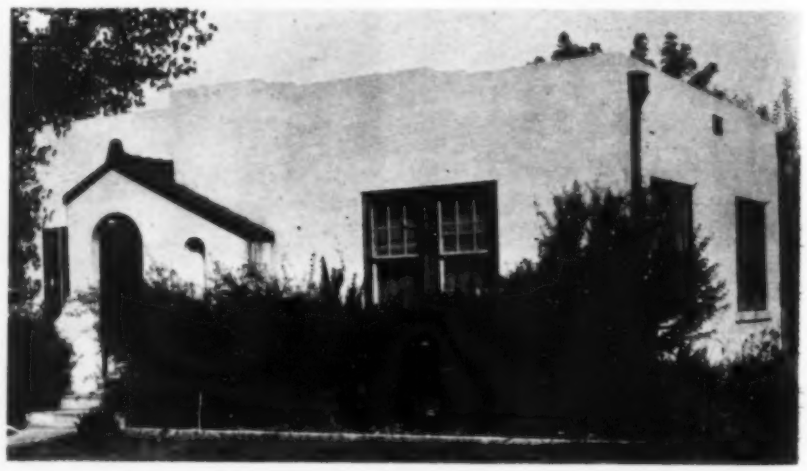
TWO WINDLASSES resting on completed lift raise one wall length, corner to corner, of inside and outside form.

Wall Forming Costs, W. C. Austin House

HOUSE — Two story 28x28x18½ ft. high.
WALL AREA — 2,072 sq. ft.
FORMS — Lift forms 3 ft. high with 2x4-in. studs, 2 ft. c. to c.
NO. OF LIFTS REQUIRED — 7 lifts of concrete 2 ft. 8 in. high.

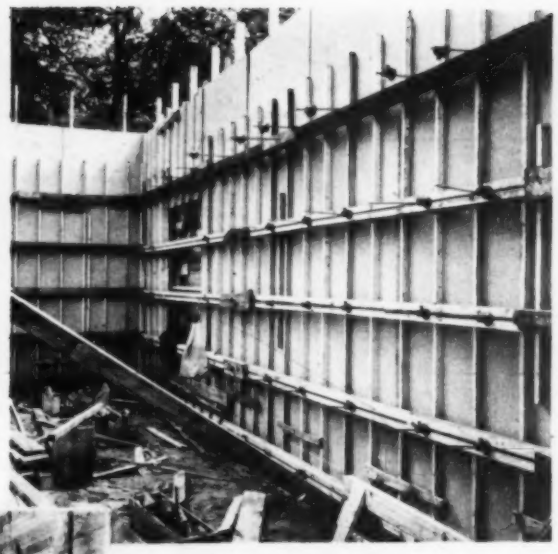
FORM MATERIAL		
Form Lumber — 1,500 B. ft. at $40.00/M	$60.00	
Rods with wing nuts, nails and misc.	10.00	
		$ 70.00
LABOR BUILDING FORM — 1½ day		
1 Foreman — 13½ hr. at $1.00	$13.50	
3 Men — 40½ hr. at $0.40	16.20	
		29.70
LABOR SETTING FORMS FIRST LIFT — 1 day		
1 Foreman — 9 hr. at $1.00	$ 9.00	
3 Men — 27 hr. at $0.40	10.80	
		19.80
LABOR SETTING FORM FOR EACH ADDITIONAL LIFT — ½ day		
1 Foreman — 4½ hr. at $1.00	$ 4.50	
3 Men — 13½ hr. at $0.40	5.40	
Cost for 6 lifts=$9.90x6 or		59.40
		$178.90
Salvage 50% form material only		35.00
		$143.90

FORM COST — With salvage allowed, 7¢ per sq. ft. of wall.
FORM COST — With no salvage allowed, 9¢ per sq. ft. of wall.



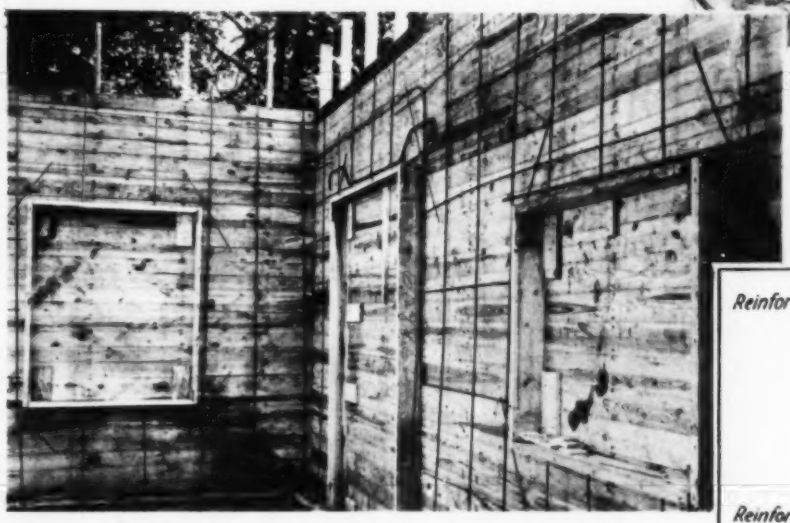
CONCRETE HOUSE in Lawton, Okla., is built by W. C. Austin with lift forms, of one-third story height, shown in sketch above.

INSULATION BOARD used as inside wall form and bonded directly to concrete is feature of Art Jordan's house, South Bend, Ind.



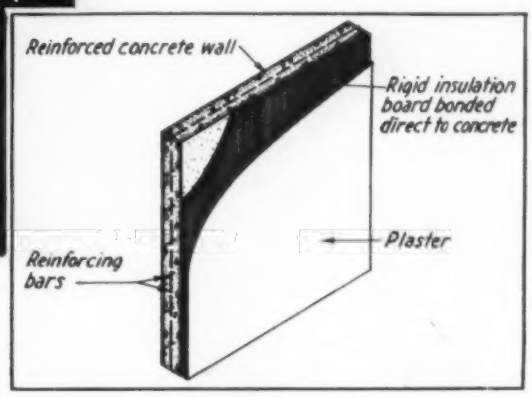
FOR INSIDE FORM, house builder uses permanent 1-in. insulation board supported by studs and wales. Carpenters erect insulation board after placing outside story-height form, window frames, door frames and reinforcing steel.

INSIDE FORM PANEL consisting of 1 in. insulation board reinforced with studs is set and tied to outside wall form previously erected.



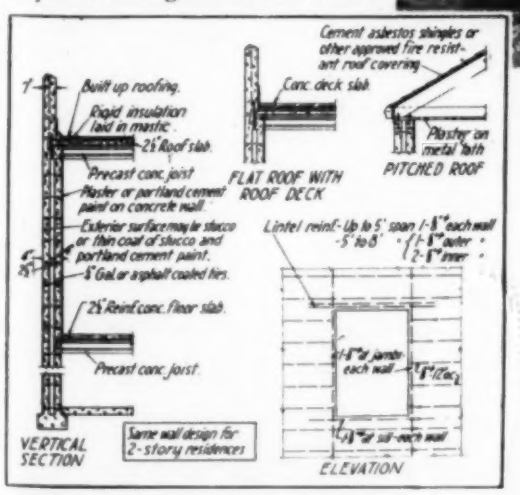
OUTSIDE WALL FORM is erected to full height, window frames and door frames are set, and reinforcing steel is placed before carpenters start erecting interior forms of insulation board.

AFTER OUTSIDE FORM has been stripped *(right)* insulation board on inside remains bonded to concrete wall as base for plaster.

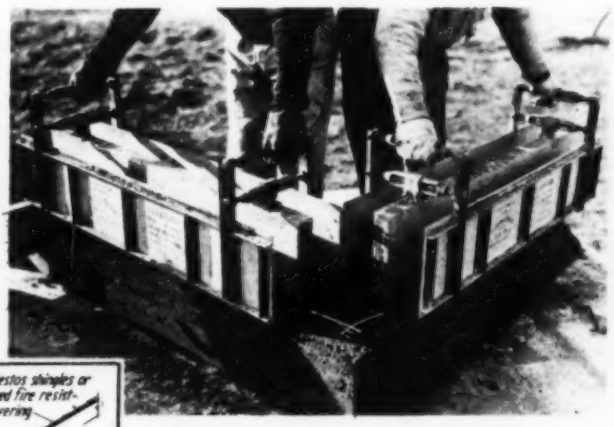


the house. This is filled with concrete up to the top form bolts. Next day bottom form bolts are pulled and top bolts loosened. Forms on one side of the house are raised with two jacks, one at each end. When the form is raised to required height, the bottom bolts are again inserted and both top and bottom bolts tightened. After bracing the form in vertical position, it is again ready for concrete.

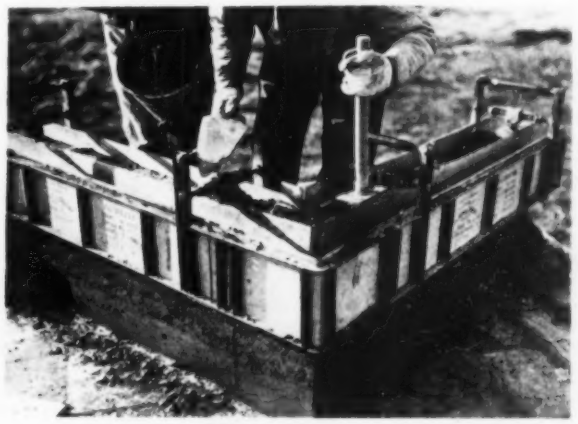
By this forming method Mr. Austin


Cement asbestos shingles or other approved fire resistant roof covering
Built up roofing.
Rigid insulation laid in mastic.
Conc. deck slab
Plaster on metal lath
Precast conc. joist
FLAT ROOF WITH ROOF DECK
PITCHED ROOF
Plaster or portland cement paint on concrete wall.
Exterior surface may be stucco or thin coat of stucco and portland cement paint.
Lintel reinf.- Up to 5' span 1-¾" each wall
5' to 8' " 1-¾" outer " 2-¾" inner "
5 Gal. or asphalt coated felt.
Reinf. conc. floor slab.
Precast conc. joist.
Same wall design for 2-story residences
VERTICAL SECTION
ELEVATION

DETAILS of hollow double concrete wall construction. Double walls, each 4 in. thick, are tied across 2½ in. air space by ¼-in. galvanized ties placed at successive lifts during construction.

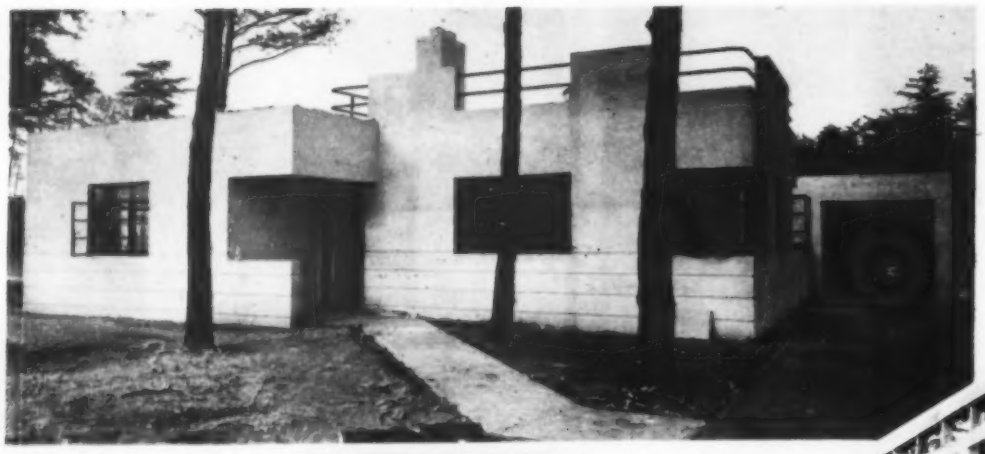


HOLLOW DOUBLE WALL FORMS are used to build concrete walls containing dead air space between two shells. Center core, resting on wall ties, supports each form unit.



SHALLOW LIFT of double wall is built up by placing and tamping dry concrete in form on two sides of center core.

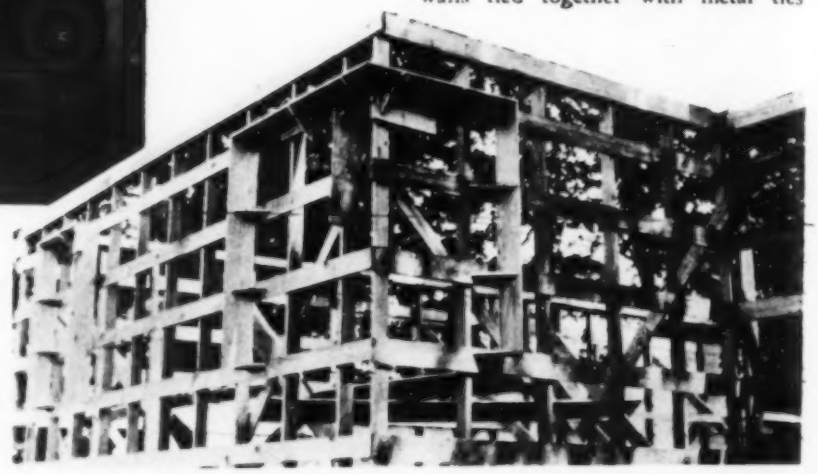
SET OF FORMS *(right)* moving progressively along wall completes successive courses of hollow double wall.

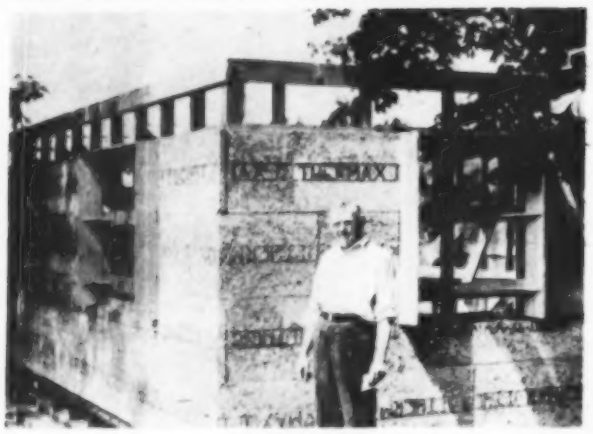


RIBBED WALL CONSTRUCTION *(left)* is used in Hines house at Silver Springs, Md.

ton, Calif., is a good example of this construction. Form boards were beveled to produce fins at the horizontal board joints and the fins were partially knocked off and the wall was painted with portland cement paint.

Reinforced concrete hollow double wall design consists of two concrete walls tied together with metal ties





INSULATION BOARD is nailed to falsework frame previously erected.

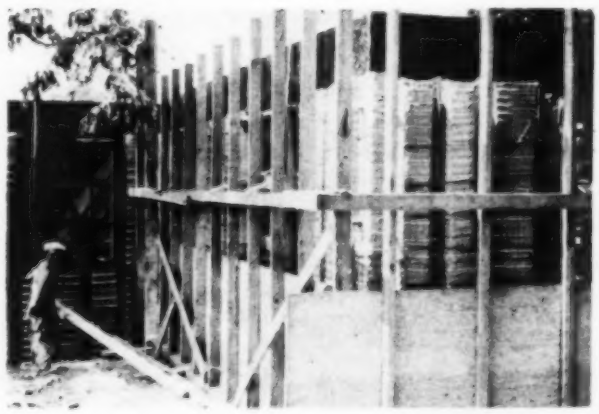
INNER FALSEWORK FRAME *(right)* with window frames attached, is first step in Hines method of ribbed wall construction.

forming an air space. A number of houses have been built throughout the country using this type of wall. It is usually built in lifts of about 9 to 12 in., using rather dry concrete with a form 4 or 5 ft. long which is clamped on the wall. This mold is moved forward after filling, making it a continuous process around the house wall.

Herewith is shown a set of hollow double wall forms consisting of two long forms, one short form, corner assembly and necessary tampers, etc.

ACCENTUATED FORM MARKINGS *(left)* distinguish Guire house, Colton, Calif. Fins left by beveled form boards are partially knocked off before house is painted.

TO FORM RIBS in walls, reinforced paper pressed into desired shape is nailed to insulation board. Between ribs, 1x4-in. wood strips support reinforced paper.



OUTSIDE FORM *(right)* of plywood completes formwork for ribbed concrete wall construction.

reports that he has been able to form house walls for 7c. per square foot of wall or 3½c. per contact foot of form allowing a 50 per cent salvage in form material and using 40c. common labor. In the accompanying tabulation the labor and material costs are given in detail.

Even if no salvage were allowed for form material the cost figure would only be 9c. per square foot of wall or 4½c. per contact foot of form. The principle of this method of forming has been quite widely used in Oklahoma and Texas, and no doubt it has considerable merit when constructing individual houses. To get a smoother exterior surface plywood may be used instead of matched boards on the outside.

Another illustration shows the house of John Duncan Forsythe, architect, of Tulsa, Okla. The walls were built using the lift form idea for the outside form only. Ordinary full height wood forms were constructed on the inside. The outside form consisted of a 5-ft. plywood form. The construction joints are concealed by decorative grooves cast in the exterior of the wall. The contractor and architect cooperated during design and construction so as to simplify locating the groove at each horizontal construction joint.

As a means of cutting form costs the use of insulation board to serve as sheathing for the inside form has received a great deal of consideration recently. The insulation board bonds to the concrete and remains in place when the uprights and walers are removed. It also serves as a plaster base. Art Jordan's house in South Bend, Ind., was built by this method. The outside wall form was first constructed full height in 8-, 10- and 12-ft. sections bolted together. Then all wall reinforcing steel and window and door frames were set. The inside form consisting of large sheets of 1-in. insulation board was put in place and supported vertically every 12 or 14 in. by means of vertical studs. The horizontal bracing was the same as for ordinary wood forms. Rods were used to tie the inside and outside forms together. Concrete was deposited in 2-ft. layers without noticeable bulging.

Sometimes form markings are accentuated and used as exterior treatment. The Guire house recently built in Colton, Calif., is a good example of this construction. Form boards were beveled to produce fins at the horizontal board joints and the fins were partially knocked off and the wall was painted with portland cement paint.

At each course ¼-in., round metal wall ties and horizontal rods are placed. The mold is then placed in the correct position for the next course and clamped on the wall. By tightening or loosening the top turnbuckle the outside form faces can be spread or collapsed leaving the center core stationary. The mold is carried by the center core resting on the wall ties. One of the pictures shows a mold in position on the wall during actual construction. The different courses in the completed wall are visible and are sometimes used as exterior treatment. However, the exterior surface is usually stuccoed or a thin coat of stucco and portland cement painted.

Since the concreting and setting of the form takes place simultaneously, form costs are not available for forming alone. Labor cost using two different types of these molds has been given as 11c. per square foot of wall for setting mold and placing concrete in a 40c. common labor market.

For a house in Silver Springs, Md., Mr. Hines has developed a forming system which he has used quite successfully in constructing ribbed house walls, using the insulation as inside form sheathing. A false framework is first erected and then the insulation board is tacked to the framework. Next, 4-in. ribs are pressed into reinforced paper, spaced to make equal spans between openings. The paper is nailed to the insulation and supported midway between ribs by a 1x4-in. board inserted between the paper and insulation. Then an outside plywood form is built and the paper rib form is bent over at the top to form a bond beam at floor or roof line. The concrete is placed in the usual way.

Form cost data on two houses built using two different commercial rib form systems give the forming cost for rib walls as 12c. and 13c. per square foot of wall in 40c. labor markets. This form cost includes depreciation, form ties, labor and hauling and handling forms to and from the job in both cases.

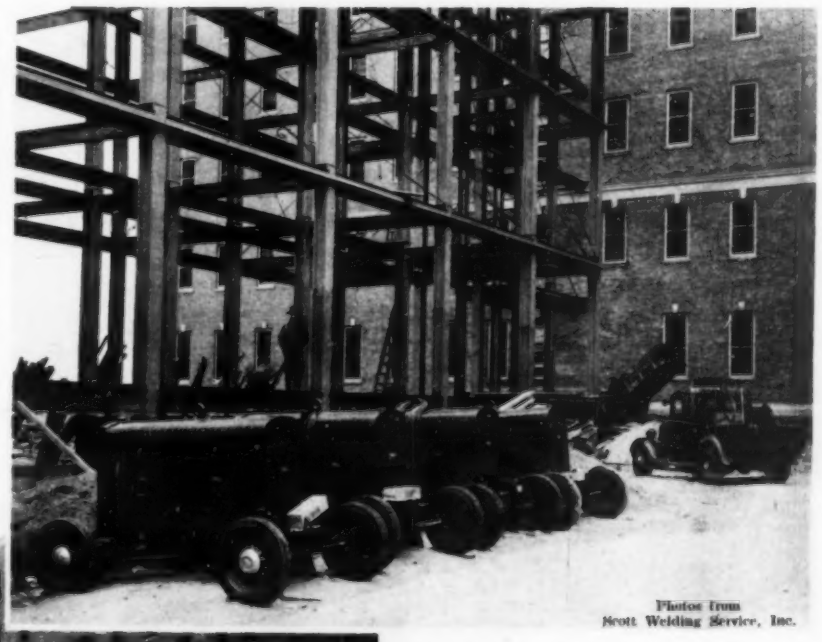
All-Welded Design Saves Steel

On Brooklyn State Hospital Extension

TWO NEW WINGS six stories high of the Brooklyn State Hospital, Brooklyn, N. Y., constitute the first large all-welded steel frame building erected in New York City. Designed by the State Department of Public Works with provision for three additional stories, the two wings required 612 tons of structural steel. Because of the heavy wind bracing required, welded connections made possible a saving of 8 to 10 per cent in steel tonnage. It is estimated that a riveted design would have required 50 to 60 tons more steel.

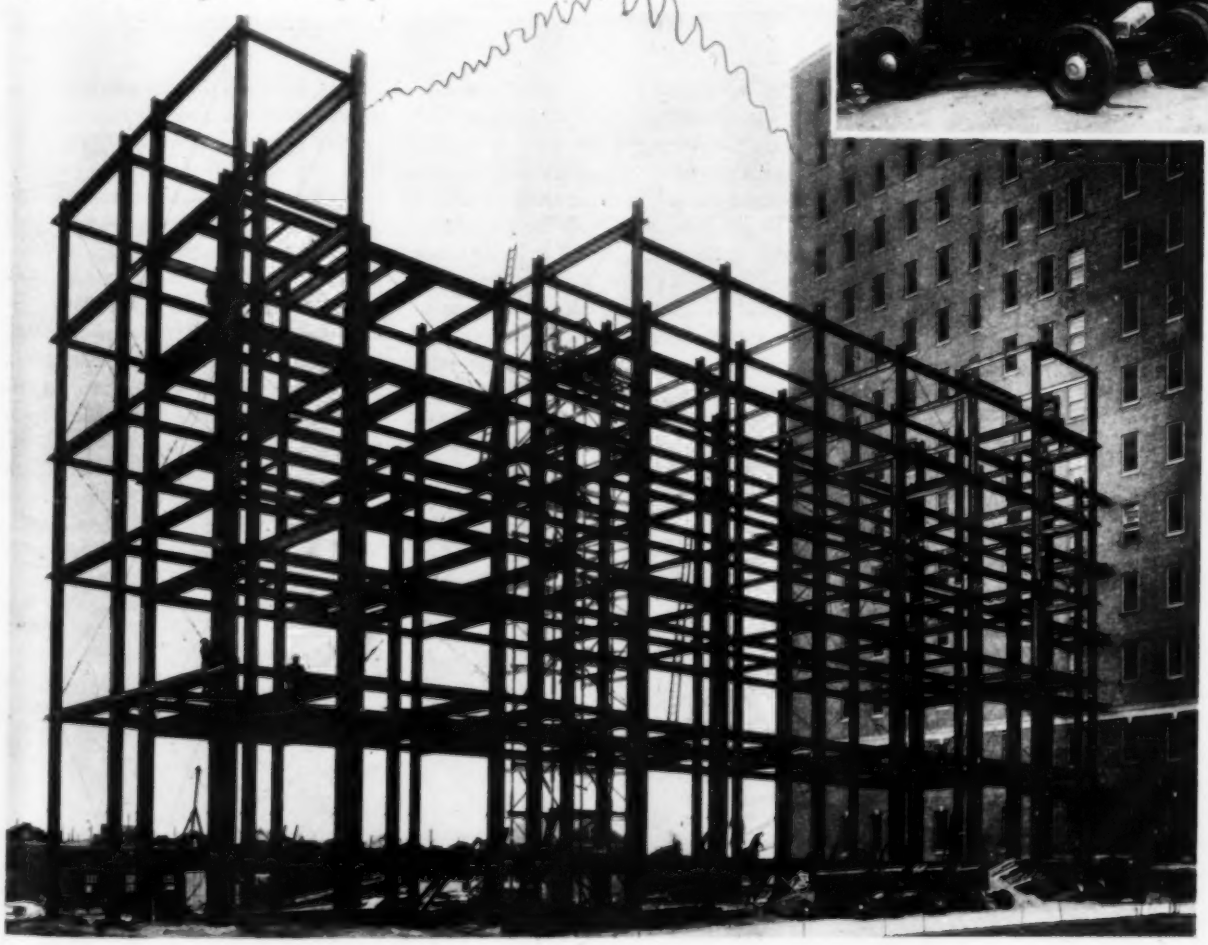
Under the old New York City building code (effective until Jan. 1, 1938, when a new building code recently approved will supersede it) practically no welded steel frame structures have been erected on property within the city's jurisdiction. As the Brooklyn Hospital is a state institution, beyond the city's control, the State Department of Public Works was free to apply modern technique to the design problem. William E. Haugaard, commissioner of architecture, State Department of Public Works, prepared the plans, and Gilbert D. Fish, New York, served as consulting engineer on the application of welding. Construction was supervised by the Division of Engineering of the Department of Public Works.

A contract for steel fabrication and erection was executed by the Ingalls Iron Works Co., of Birmingham, Ala., and Pittsburgh, Pa. This firm subcontracted steel erection to the Benz Contracting Co., Long Island City, N. Y., which in turn sublet the field welding to Scott Welding Service, Inc., Long Island City. The general contract for the two wings was awarded to the Caye Construction Co., Brooklyn.



Photos from Scott Welding Service, Inc.

PORTABLE WELDING MACHINES supply current to operators making field connections. Heavy wind bracing makes welded design particularly economical, saving 8 to 10 per cent of steel tonnage by means of simple connections.



ALL-WELDED STEEL FRAME of one of two new wings of New York State Hospital in Brooklyn rises six stories above ground. Design provides for three stories to be added later.

More building of this type may be expected in New York City after the new code goes into effect. Under Iron and Steel Construction the new code provides: "Fusion welding may be substituted for, or used in combination with, riveting or bolting to connect or assemble the component parts of steel beams, girders, lintels, trusses, columns and other structural steel used in building construction if done under rigid inspection and specification in accordance with the rules of the Board (of Standards and Appeals)."

Man-Hour Employment Records

For Four Grade Separations

CONTRACT 1 involves highway overpass consisting of concrete-in-cased steel girders and concrete deck on concrete bents of multiple-span viaduct. THREE-DRUM HOIST DERRICK *(in inset)* erects steel in structure.

Contract 1... Overpass

QUANTITIES AND PRICES

Item	Contract Quantity	Unit	Unit Price	Final Quantity	Amount Earned
Common excavation	500	Cu. yd.	0.21	537	$112.77
Dry struct. excavation	946	Cu. yd.	1.00	984	984.00
Class A Concrete	589.15	Cu. yd.	18.00	589.22	10,605.96
Class B Concrete	453.15	Cu. yd.	18.00	454.72	8,184.96
Class Enc. Concrete	15.89	Cu. yd.	30.00	15.42	462.60
Reinforcing steel	219,492	Lb.	0.038	219,601	8,344.83
Concrete railing	733	Lin. ft.	2.25	732.2	1,647.45
Structural steel	27,754	Lb.	0.041	27,700	1,135.70
Overhaul	1,000	Sta.-yd.	0.02	1,219	24.38
Fine grading	3,764	Sq. yd.	0.07	3,776	264.32
Concrete pavement	3,812.6	Sq. yd.	2.10	3,812.6	8,006.46
Concrete spillways	34.54	Cu. yd.	20.00	36.87	737.40
Reinf. steel, Type 2	15,515	Lb.	0.05	15,515	775.75
Class A Conc.	0.46	Cu. yd.	30.00	0.46	13.80
Class B Conc.	3.76	Cu. yd.	20.00	3.76	75.20
Reinf. steel	1,942	Lb.	0.04	2,120	84.84
Sodding	1,810	Sq.	0.25	2,324	581.00
Met. bearings & exp. dev.	15,111	Lb.	0.0825	15,201	1,254.08
Lip curb	3,229	Lin. ft.	0.20	2,674	534.80
Guard fence	1,984	Lin. ft.	0.70	2,027	1,418.90
Br. name plates	2	Each	12.00	2	24.00
				Total	$45,273.20

LABOR COSTS

Classification	Man-Hours	Total Wages
Executive, administrative, and supervisory	6,586	$3,799.42
Skilled	5,471½	2,819.39
Intermediate	1,206	427.50
Unskilled	15,262½	3,232.90
Total	28,526	$10,279.21

MATERIAL COSTS

Materials	Quantity	Total Cost
Portland cement, bbl.	2,874½	$7,128.76
Tar products, gal.	20	15.00
Gravel, tons	2,028.51	3,144.90
Sand, tons	1,233.87	1,789.01
Guard fence, lb.	11,095	745.92
Structural steel, lb.	28,127	992.32
Reinforcing steel, lb.	249,942	6,530.12
Piling, wood		1,222.67
Met. brs. & exp. dev., lb.	15,170	1,061.90
Motor fuel		976.74
Miscellaneous materials		1,430.31
	Total	$25,037.65

TO BUILD four grade separations in a Lower Mississippi Valley state, contractors used human labor to the extent shown in accompanying man-hour employment tables. The projects were built by four separate contractors under specifications which contained no man-hour requirements. Thus the builders were free to operate in the most economical way possible. Because of the low wage rates prevailing in the localities where the jobs were built, the contractors undoubtedly used a larger number of man-hours than would have been the case under high wage conditions. Most of the jobs were amply supplied with mechanical equipment, as will be noted in succeeding paragraphs relating to the individual contracts.

As a guide to the volume and value of work in each contract, other tables give (1) contract quantities and prices and (2) cost of materials purchased and used in completing the job. The employment tables record wages paid in addition to the man-hours of labor in each of four classifications. Employment figures are absolutely accurate, but the records of material costs are subject to more critical examination because of the possibility that a general contractor may have subcontracted some part of his work and neglected to report the cost of materials purchased by the subcontractor. This possibility does not apply to the labor report, which is complete and comprehensive in all respects.

It must be emphasized that the costs

Contract 2... Underpass

QUANTITIES AND PRICES

Item	Contract Quantity	Unit	Unit Price	Final Quantity	Amount Earned
Common excavation	2,486	Cu. yd.	0.40	1,465	$586.00
Dry struct. excavation	692	Cu. yd.	1.50	641.38	962.07
Wet struct. excavation	30	Cu. yd.	2.00	54.67	109.34
Rock struct. excavation	43	Cu. yd.	3.00	47.06	141.18
Class A concrete	37.27	Cu. yd.	24.00	37.27	894.48
Class B concrete	1.79	Cu. yd.	23.00	1.79	41.17
Class A concrete	353	Cu. yd.	20.00	347.55	6,951.00
Reinforcing steel	18,286	Lb.	0.048	19,085	916.08
Structural steel	65,120	Lb.	0.055	65,120	3,581.60
Treated timber piling	25	Lin. ft.	2.00	25	50.00
R.C. pipe, 24-in.	63	Lin. ft.	4.50	63	283.50
C.M. pipe, 6-in. & 8-in.	80	Lin. ft.	1.95	80	156.00
Cem. rubb. masonry	72.9	Cu. yd.	12.00	84	1,008.00
St. grid br. floor	527	Sq. ft.	1.31	525.66	688.61
Class S concrete	13	Cu. yd.	18.00	12	216.00
Traff. serv. gravel	399	Cu. yd.	2.00	399	798.00
Dampproofing	1,900	Sq. ft.	0.02	2,820	56.40
Memb. waterproofing	618	Sq. ft.	0.16	611	97.76
Conc. spillway	0.76	Cu. yd.	25.00	0.76	19.00
Asphalt plank	615	Sq. ft.	0.47	608	285.76
Reinf. steel	6,725	Lb.	0.04	6,667	266.68
Conc. pavement	1,580.69	Sq. yd.	1.63	1,580.69	2,576.52
Lip curb	272	Lin. ft.	0.32	272	87.04
Concrete curb	720	Lin. ft.	0.35	720	252.00
Relay culvert pipe	44	Lin. ft.	1.00	44	44.00
Treated timber pile cut-off	0	Lin. ft.	.50	7	3.50
Sta.-yd. overhaul	63	Sta.-yd.	0.02	0	0.00
Fence moved & replaced	11	Rods	1.00	29.2	29.20
Br. proj. mkr. plates	2	Each	5.00	2	10.00
Reconstructing dug wells	20	Lin. ft.	3.00	0	0.00
Traff. serv. gravel hauled ea. add. mile	399	Cu. yd.	0.05	399	19.95
				Total	$21,130.84

LABOR COSTS

Classification	Man-Hours	Total Wages
Executive, administrative, and supervisory	1,291	$745.85
Skilled	1,397½	698.75
Intermediate	1,081	378.36
Unskilled	17,679	3,535.80
Total	21,448½	$5,358.76

MATERIAL COSTS

Materials	Quantity	Total Cost
Portland cement, bbl.	1,131	$2,760.25
Asphaltic cement, lb.	3,095	39.22
Stone, cu. yd.	84	252.00
Gravel, cu. yd.	588	1,046.64
Sand, cu. yd.	378	559.44
Structural steel, lb.	65,120	2,813.06
Reinforcing steel, lb.	21,103	608.14
Piling, wood, ft.	25	14.20
Concrete culvert pipe, ft.	63	157.50
Metal culvert pipe, ft.	80	62.70
Motor fuel		339.38
Miscellaneous materials		1,940.20
	Total	$10,893.01

CONTRACT 2 calls for construction of concrete and steel railroad bridge across new highway underpass at one end of railroad trestle.

Contract 3 . . . Underpass and Pavement

QUANTITIES AND PRICES

Item	Contract Quantity	Unit	Unit Price	Final Quantity	Amount Earned
Solid rock excavation	2,211	Cu. yd.	1.20	2,548.3	$3,057.96
Unclassified excavation	8,177	Cu. yd.	0.40	8,526.9	3,410.76
Dry struct. excavation	706	Cu. yd.	1.00	943.9	943.90
Rock struct. excavation	6?9	Cu. yd.	5.00	501.64	2,508.20
Class A concrete	105.63	Cu. yd.	19.00	105.63	2,006.97
Class B concrete	1.30	Cu. yd.	25.00	2.75	68.75
Class S concrete	18.00	Cu. yd.	21.00	18.0	378.00
Reinforcing steel	11,884	Lb.	0.04	11,897	475.88
Structural steel	44,756	Lb.	0.055	44,119	2,426.54
Class A conc. (Br.)	412	Cu. yd.	19.00	425.32	8,081.08
Reinf. steel (Br.)	22,370	Lb.	0.04	22,376	895.04
Clearing	1.819	Acre	100.00	1.30	130.00
Grubbing	1.819	Acre	100.00	2.29	229.00
Conc. pavement	5,761	Sq. yd.	2.25	5,693.8	12,811.05
Reinf. steel, pvmt.	25,712	Lb.	0.045	25,412	1,143.54
Lip curb	2,460	Lin. ft.	0.15	2,473.2	370.98
Memb. waterprfg.	431	Sq. ft.	0.20	447.0	89.40
Conc. sidewalk	135.2	Sq. ft.	0.25	135.17	33.79
Conc. spillway	4.420	Cu. yd.	30.00	4.71	141.30
Sodding	993	Sq.	0.30	1,003.2	300.96
R.C. pipe, 18-in.	27	Lin. ft.	3.00	81.0	243.00
R.C. pipe, 24-in.	99	Lin. ft.	4.00	198.0	792.00
C.M. pipe, 18-in.	150	Lin. ft.	2.50	46	115.00
Drop inlet	2	Each	60.00	2	120.00
Concrete pvmt. (SP)	344	Sq. yd.	2.50	344.44	861.10
Conc. curb	200	Lin. ft.	0.40	200	80.00
Bronze proj. mkr. pl.	2	Each	15.00	2	30.00
Pipe handrailing	80	Lin. ft.	2.00	80.13	160.26
Junc. boxes	1	Each	60.00	1	60.00
Dampproofing	2,571	Sq. ft.	0.04	2,634	105.36
Fence moved & repl.	113	Rods	0.50	98.3	49.15
Asphalt plank	431	Sq. ft.	0.50	431.0	215.50
Overhaul	0.0	Sta.-yd.	0.02	1,653.0	33.06
				Total	$42,367.53

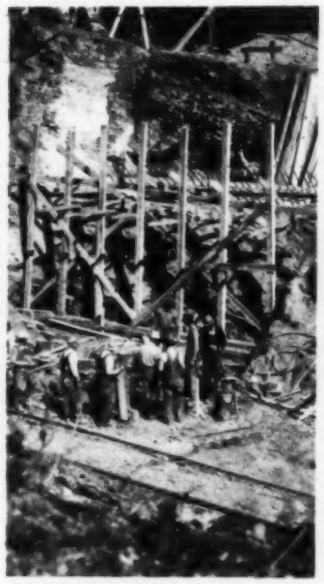
LABOR COSTS

Classification	Man-Hours	Total Wages
Executive, administrative and supervisory	6,351	$3,159.07
Skilled	2,838	1,602.12
Intermediate	4,225½	1,516.54
Unskilled	35,423½	7,084.70
Total	48,838	$13,362.43

MATERIAL COSTS

Materials	Quantity	Total Cost
Portland cement, bbl.	2,850	$6,412.50
Gravel, cu. yd.	1,621	4,189.33
Sand, cu. yd.	1,028	2,278.36
Structural steel, lb.	45,000	1,878.87
Reinforcing steel, lb.	85,305	2,475.94
Lumber, 1000 ft. b.m.	10	866.50
Concrete culvert pipe, ft.	279	616.50
Metal culvert pipe, ft.	46	80.79
Motor fuel, gal.	4,790	883.27
Miscellaneous materials		1,625.27
	Total	$21,307.33

CONTRACT 3 comprises steel girder railway bridge, on curved concrete abutments, and paving of underpass roadway.



TIMBER FALSEWORK is erected to support arch on Contract 4 during concreting.

reported here are for *labor and materials only*. The tables include *no record* of the multitude of additional items which helped to swell the total cost of completing each contract. Among these omitted items may be mentioned liability and compensation insurance, taxes, office expense, moving plant, equipment rental or depreciation, repairs, overhead, and profit. Employment records accompanying these notes have only one value: They serve as a rough yardstick of the man-hours of labor required to build grade separations of specified sizes and types in the communities where these projects were completed. The figures may be used as a check upon estimated employment requirements in building similar projects in other localities having approximately equal wage scales. Beyond this point, it is not safe to apply them to new or proposed work.

Contract 1—A viaduct consisting of steel girders and concrete deck on concrete bents (illustrated by accompanying photographs) was built at a cost of $45,273 with employment of 28,526 man-hr. of labor. The contractor operated at various times on this project one two-bag concrete mixer, one steam crane with a long boom, three tractors, three scrapers (two of them having 12-yard bowls), one scarifier, one three-drum steel erection derrick, one bulldozer, one blade grader and five trucks.

Contract 2 — An underpass comprising concrete abutments and steel girders was constructed for $21,130 at one end of a railroad trestle, as shown by an accompanying photograph. The contractor employed 21,448½ man-hr. of labor and used little mechanical equipment, the only machinery recorded for the project being one two-bag concrete mixer.

Contract 3 — An underpass and concrete pavement costing $42,367 employed labor to the amount of 48,838 man-hr. The contractor used one two-sack concrete mixer, one ¾-yd. gasoline shovel, plows and fresno scrapers, three trucks, one 35-hp. tractor, one blade grader, one air compressor and one pneumatic rock drill.

Contract 4 — A concrete arch spanning a railroad, constructed for $15,364, furnished 11,806½ man-hr. of employment. Mechanical equipment on the job included one air compressor, one jackhammer drill, one two-sack concrete mixer, one one-sack concrete mixer, one ½-yd. gasoline shovel, three fresnos, three trucks, one band saw, one blade grader, one tractor and plows.

Contract 4 . . . Overpass

QUANTITIES AND PRICES

Item	Contract Quantity	Unit	Unit Price	Final Quantity	Amount Earned
Solid rock excavation	203	Cu. yd.	1.75	233	$407.75
Uncl. excavation	11,236	Cu. yd.	.23	14,120	3,247.60
Dry struct. excavation	104	Cu. yd.	.90	105.44	94.90
Rock struct. excavation	303	Cu. yd.	3.75	282.42	1,059.08
Class A concrete	134.03	Cu. yd.	18.00	137.94	2,482.92
Class B concrete	2.6	Cu. yd.	18.00	3.68	66.24
Class S concrete	112.9	Cu. yd.	21.00	113.18	2,376.78
Reinforcing steel	35,860	Lb.	.045	35,567	1,600.52
Concrete railing	173	Lin. ft.	.90	173.5	156.15
Br. p. mrk. plates	2	Each	12.00	2	24.00
Bronze b. n. plts.	1	Each	15.00	1	15.00
Membrane waterprfg.	2,195	Sq. ft.	.60	2,326	1,395.60
Clearing	1.762	Acre	50.00	1.825	91.25
Grubbing	1.390	Acre	100.00	1.991	199.10
Overhaul	65,756	Sta.-yd.	.02	5,128	102.56
R.C. Pipe, 18-in.	126	Lin. ft.	2.60	147	382.20
C.M. Pipe, 18-in.	20	Lin. ft.	1.75	20	35.00
Relay culv. pipe	66	Lin. ft.	.75	91	68.25
Fence removed & repl.	168	Rods	1.00	155.5	155.50
Traffic serv. grav.	441	Cu. yd.	3.00	468	1,404.00
				Total	$15,364.40

LABOR COSTS

Classification	Man-Hours	Total Wages
Executive, administrative and supervisory	2,233	$1,173.30
Skilled	1,343	671.50
Intermediate	1,523½	533.19
Unskilled	6,707	1,341.40
Total	11,806½	$3,719.39

MATERIAL COSTS

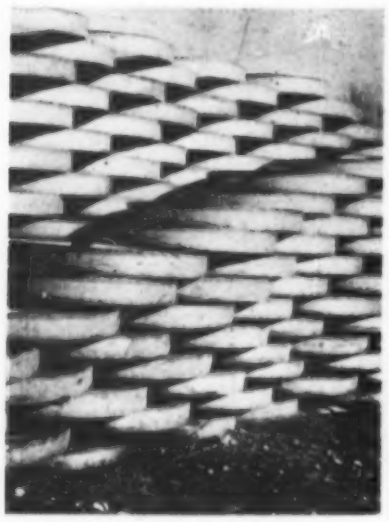
Materials	Quantity	Total Cost
Portland cement, bbl.	394¾	$933.52
Asphaltic cement, lb.	4,400	147.08
Stone, cu. yd.	648	1,035.98
Sand, cu. yd.	176.5	307.92
Reinforcing steel, lb.	36,356	986.86
Lumber, 1,000 ft. b.m.	27.014	500.96
Piling, wood, ft.	12.60	37.80
Concrete culvert pipe, ft.	147	214.56
Metal culvert pipe, ft.	20	24.11
Motor fuel		1,053.57
Miscellaneous materials		3,203.36
	Total	$8,445.72

CONTRACT 4 replaces old grade crossing with concrete arch carrying relocated highway across railroad in cut.

Steel-Cored Concrete Pipe

Precast at Rate of 50 Sections Per Day

STEEL SHEETS for cylindrical core of precast reinforced-concrete pipe are rolled to circular arc of 120 deg. in electric-motor-driven rolls. Three sheets form one cylinder.



GALVANIZED JOINT RINGS for cylindrical steel cores are stacked in piles at pipe plant.

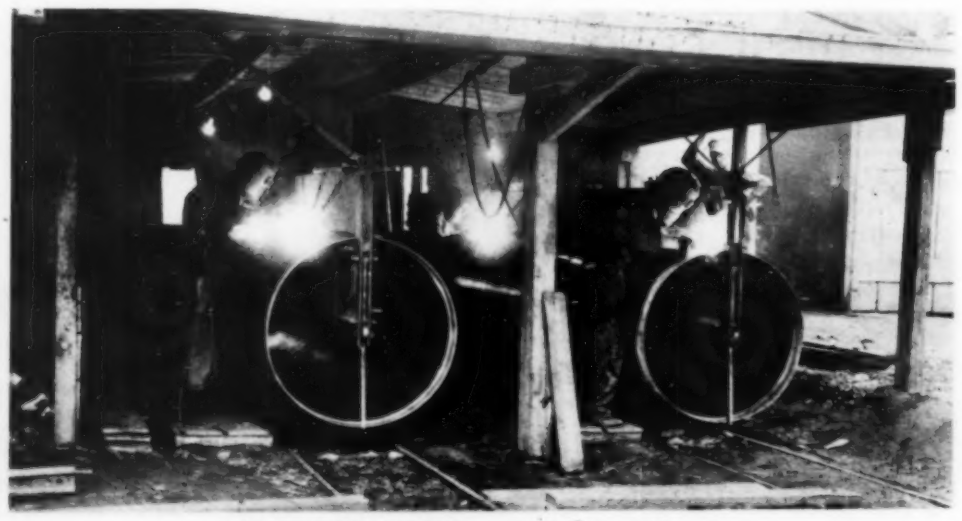
MAKING EFFECTIVE USE of special equipment and experience gained on a great number of pipe-line projects, the Lock Joint Pipe Co., Ampere, N. J., contractor for 32.4 mi. of 39-in. water supply line at Little Rock, Ark., laid out and now is operating a complete, well-balanced manufacturing plant producing steel-cylinder reinforced-concrete pipe at the rate of 50 16-ft. sections per day. Each pipe section contains, in its walls of dense concrete placed and vibrated in vertical forms, a cylindrical steel core of welded plate and a cage of spiral reinforcing wire. Accompanying photographs illustrate certain steps in the manufacturing process, particularly those operations relating to the fabrication of the cylindrical steel core and reinforcing cage.

Three types of pipe were proposed by the Burns & McDonnell Engineering Co., Kansas City, Mo., designing and supervising engineers for the City of Little Rock on the water supply project, as satisfactory for use in the water supply line. The city received bids on the three types — cast-iron, steel and reinforced-concrete. On a low bid of $1,562,682.72, submitted by the Lock Joint Pipe Co. to cover both furnishing and installing steel-cylinder reinforced-concrete pipe, the city awarded the contract to this bidder.

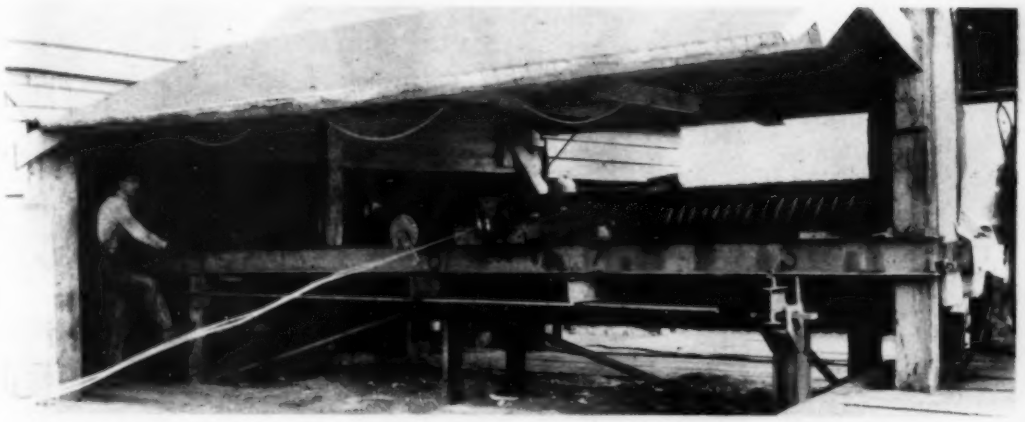
For bidding purposes, the proposal divided the pipe line into four pressure classifications, marked by the following limits of hydrostatic head: 0 to 100 ft., 101-200 ft., 201-300 ft. and 301-400 ft. A price was submitted for pipe in each of the three classifications, and the contractor receives payment on this basis. In actual manufacture of the pipe, however, the contractor holds the amount of reinforcement closer to the actual design requirements by breaking down the hydrostatic pressures into ten

STEEL CYLINDERS are formed by assembling rolled sheets, with ¾-in. lap at longitudinal seams, inside galvanized joint rings. Sheets are locked in position by internal expanding rings until welded.

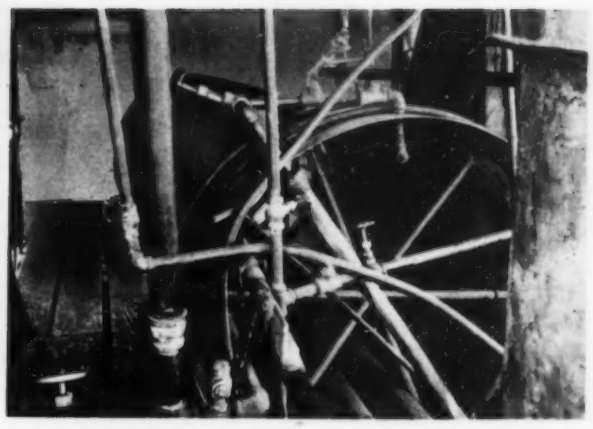
AFTER GALVANIZED JOINT RINGS have been welded to steel cylinder, internal rings are removed.



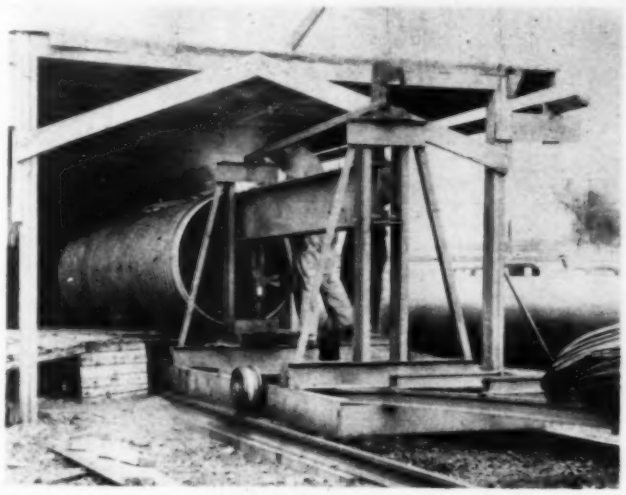
LONGITUDINAL SEAMS are welded on outside only.



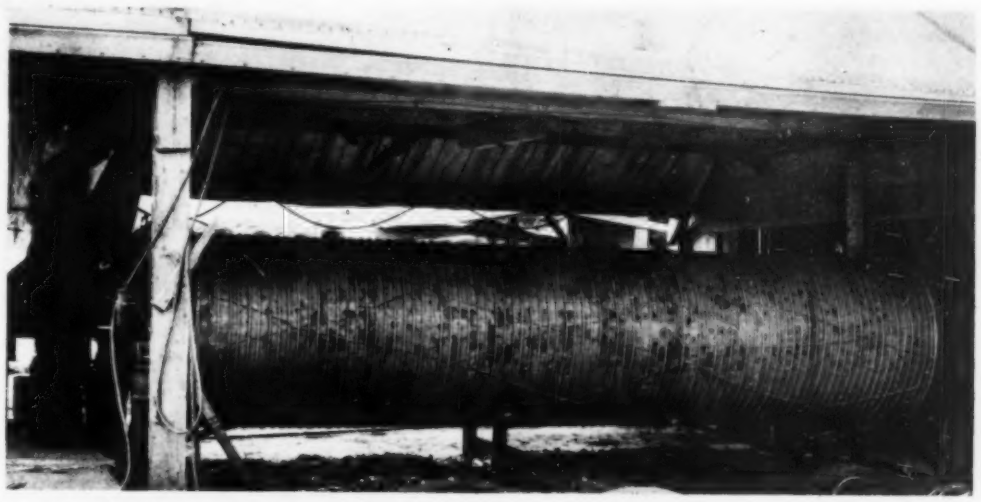
SPIRAL REINFORCING CAGE is wound on mandrel by specially designed electric-motor-driven machine which synchronizes turning speed of mandrel and travel speed of winding unit to wrap steel reinforcing wire at desired spacing. First winding of reinforcing wire is followed by second winding which applies wire at intermediate spacing.



HYDROSTATIC PRESSURE APPARATUS tests welded cylinders up to 20,000 lb. per square inch.



CANTILEVER ARM on rolling steel carriage supports steel cylinder while reinforcing cage is being welded.

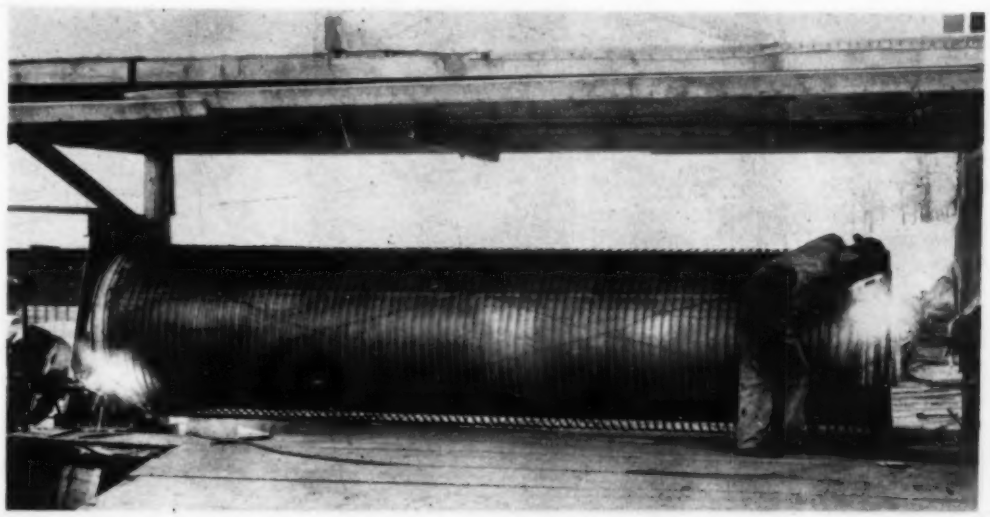


FOLLOWING WINDING of first spiral, diagonal reinforcing wires are strung between two ends of mandrel, and second intermediate spiral then is wound on top of diagonal wires, giving final cage of designed wire spacing with longitudinal wires woven between successive loops of spiral steel.

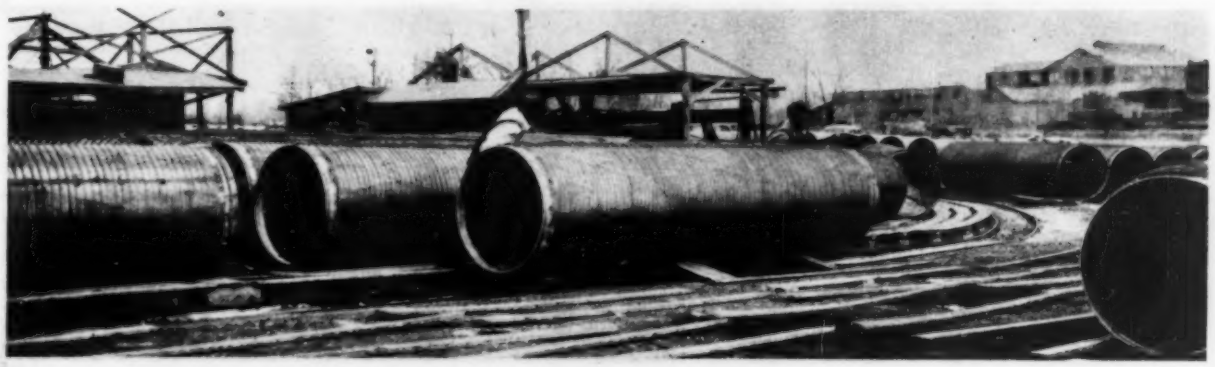
heads ranging from a minimum of 182 ft. to the maximum of 335 ft. Using four gages of black annealed steel sheets (14- to 11-gage, inclusive) and three diameters of steel reinforcing wire (27/64 in., 15/32 in., and 9/16 in.), the contractor varies plate thickness, wire diameter and wire spacing to obtain designed pipe strength with minimum reinforcement.

Concrete for the pipe is proportioned on a 1:1.31:2.32 basis, with a cement factor of about 1.9 bbl. per cubic yard, and is mixed in 1.15-cu.yd. batches by a 28S mixer operating under a 2½-min. mixing specification. Sufficient water is added to produce a slump of about 4 in. Aggregates are weighed, and water is measured by volume. The maximum size coarse aggregate is ¾-in. trap rock, and river sand is used as fine aggregate. At an age of 28 days, test cylinders made with this concrete have a compressive strength of 5,500 to 6,000 lb. per square inch.

Pipe forms are erected in vertical position on steel base rings which serve both as a mold for the bell end of the pipe and as a guide for locating the inner and outer forms and the cylindrical core concentrically. A locomotive crane with a goose-neck boom first places the inside form, followed by the steel core and cage assembly. On the inside form, the crane then places the



COMPLETED REINFORCING CAGE *(left)* is transferred from mandrel on to cylindrical steel core. Welders then anchor reinforcing cage to steel core with spacer bars at both ends of cylinder.



COMPLETED PIPE CORES, with reinforcing cages attached, ride on narrow-gage railway trucks to storage yard, where they remain until picked up for use in concrete pipe.

HAND CRANK *(below)* controls gate opening through which concrete passes into pipe forms. Flange of apron over which concrete slides at bottom of bucket is shaped to deliver concrete to both sides of cylindrical steel core in pipe form.

PIPE-CASTING LAYOUT embraces batching and mixing plant, three concreting bays, with capacity of 50 pipes each, and locomotive crane for handling forms, concrete and finished pipe. In 10 to 14 hr. after concreting, forms are stripped from pipes and bay is inclosed with wooden and canvas covers. After wet steam curing for 24 hr. in covered bay, pipes are stored on skids in yard for 10 days' additional curing under wet burlap.

CONCRETE BUCKETS specially designed for pipe-casting operation are placed on top of forms by locomotive crane. Vibrators are used during and after pouring to produce desired concrete density. One of these vibrators may be seen attached to top platform of pipe form in left background.

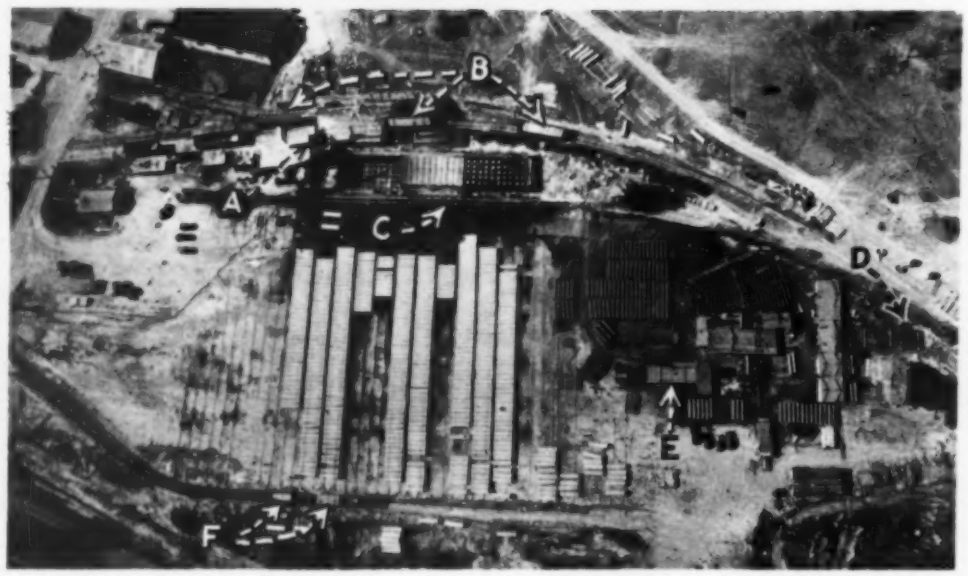
POURING BAYS *(right)*, used in rotation for casting concrete pipe, reveal stages in manufacturing process. In foreground, on floor of one bay, are base rings on which pipe forms, steel cylinders and cage reinforcement will be assembled vertically prior to concreting. Pipe forms already set up in adjacent bay are being filled with concrete from three buckets delivered by locomotive crane. Base ring forms bell end of pipe.

top platform, which serves to locate the inside form, the cylindrical core and the outside form concentrically at the top of the pipe. Finally, the outside form is set by the crane. The concrete crew installs temporary spacer bars vertically in the form to hold the reinforcing cage rigidly in position while concrete is being placed. Electric vibrators attached to the form are operated continuously throughout the concreting process. The top spigot end of the pipe is molded by hand with special trowels.

It was the usual practice of the contractor to cover the forms with canvas and steam them with jets inside and outside the pipe. In all cases the top platforms and the pipe forms can be stripped on the morning following the placing of concrete. After stripping the forms, the contractor covers the pipes and steams them for 24 hr. with moist steam.

At the end of 24 hr. of steam curing, the locomotive crane tips the pipe out on skids, using a semicircular steel band and a sling around the pipe to support the units during handling. The pipes then are stored on skids in the yard for 10 days, during which they are kept moist by sprinkling. In warm weather, the pipes are covered with burlap during this curing period. After the 10 days of curing, pipe are ready to be loaded on flat-bed truck-trailers for delivery to the right-of-way. A depressed road for the trucks permits the pipe to be rolled off the ends of the skids on a level with the trailer bed.

Administration—Engineering design and supervision of Little Rock's water supply project are responsibilities of the Burns & McDonnell Engineering Co., Kansas City, Mo. Marion L. Crist, resident engineer, represents this consulting firm on the project and has full charge of all features of the work for the city. For the Lock Joint Pipe Co., Ampere, N. J., L. G. Wilhelm is general manager of contract operations at Little Rock, Ark., with G. B. Parsons, plant superintendent, in charge of pipe manufacture



PIPE PLANT *(left)* as seen from air. Certain features are indicated: (A) batching and mixing plant, (B) railroad cars of cement and aggregates, (C) locomotive crane runway, (D) rolls for shaping steel plate, (E) location of winding machine and welding shop for reinforcing cage, (F) truck-trailers being loaded with precast pipe.

JOB ODDITIES

A MONTHLY PAGE OF

Unusual Features of Construction

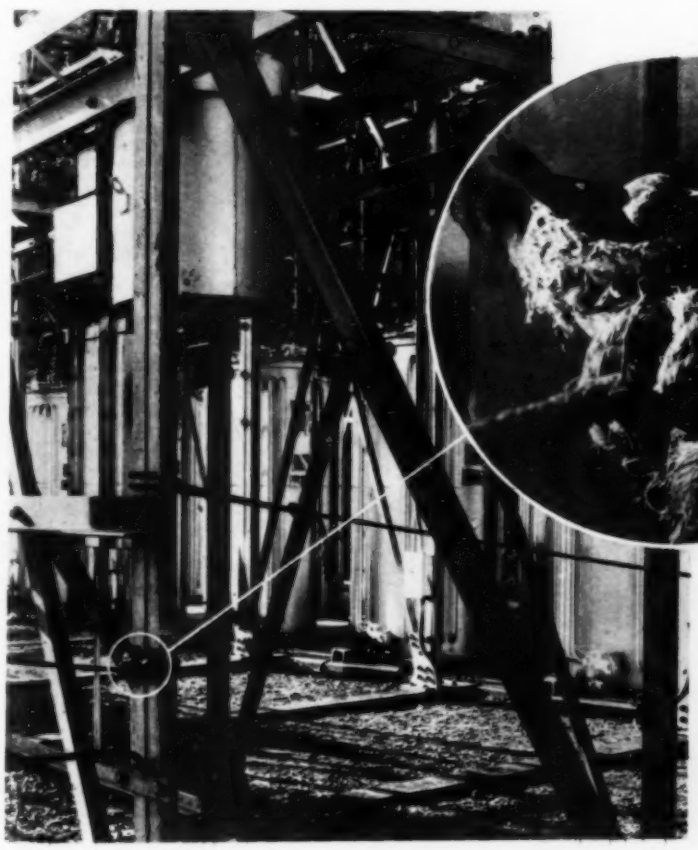
WATER BRINGS FLOWERS

to thirteen Southern California cities comprising Metropolitan Water District, which symbolized achievement of 10,000 engineers and workers in building Colorado River aqueduct with this Tournament of Roses float, "The Fountain of Youth," bearing fair representatives from member cities.

$15,000 PER LIFT

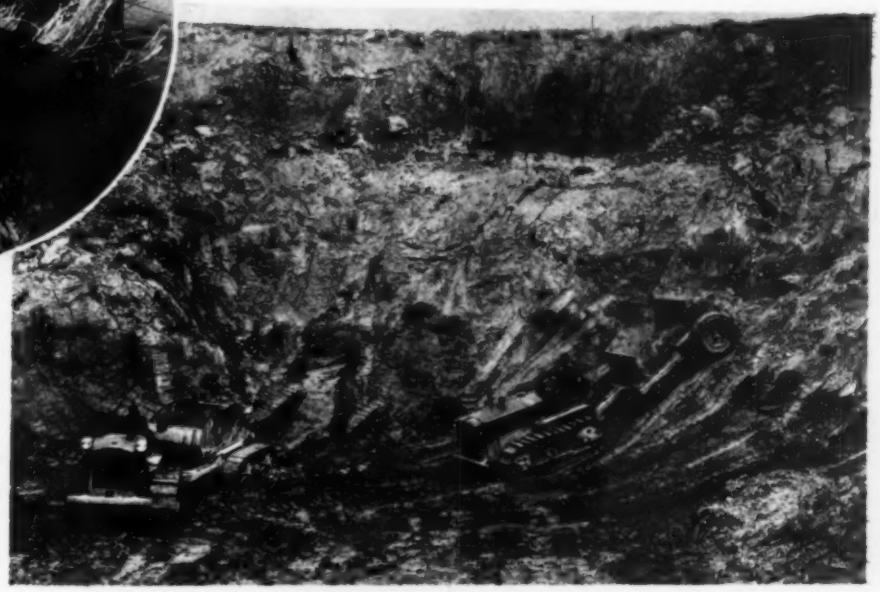
is money-moving record of P&H truck crane, which handles $600,000 worth of Chinese dollars, stored in this country by Chinese government, at rate of three $5,000 boxes per load in transferring silver from old to new quarters of San Francisco mint.

Hang it! There Goes Our Beer!



TRANSFORMER STATION HUMS

with more than electric power when diminutive humming bird is discovered nesting on knot of guy rope attached to transformer frame at Lawrence adit of San Jacinto tunnel, being driven by Metropolitan Water District of Southern California on Colorado River aqueduct. Following discovery of nest by workman, Mike Leadbetter, general superintendent on tunnel, gives orders that rope is to remain in place and bird is not to be disturbed.



SHAFT DIGGERS

of new type open pit 65 ft. deep and 300 ft. in diameter as first step in sinking of shaft for new mine of Consolidated Coal Co. at Herrin, Ill. Allis-Chalmers tractors back Continental scrapers up steep banks and pick up loads on down trips, hauling spoil out of hole on ramp and disposing of it 1,000 yd. away. Two units work 21 hr. a day to complete pit excavation, over which shaft house will be constructed to inclose hoists and other mine machinery.

ON MISSISSIPPI'S $42,000,000 H

CONTRACTORS FIND THAT TRACTOR WEIGHT SAVED MEANS EXTRA PAYLOAD *Gained*

WHEN the great, planned program of highway improvement got under way in Mississippi ... Allis-Chalmers Tractors got the call! In 12 months' time, 80 contractors were awarded 232 contracts ... involving 1,605 miles of the 2,715 miles designated by the state legislature. On the majority of these jobs, Mississippi has "gone Allis-Chalmers." Contractors are selecting Controlled Ignition Oil Tractors to speed up the work. There is no excess weight in Allis-Chalmers Tractors ... you haul payload, not dead load. You get better BALANCE, higher working speeds, quicker pick-up, less maintenance. All this means "Cheaper-per-yard" performance. Ask the A-C dealer!

90% VS. 10%

On the average construction job, you do 90 per cent of your tractor work at the higher operating speeds. Allis-Chalmers Tractors are designed to deliver maximum performance at these higher speeds. Buy tractors for this 90% of your work ... not for the other 10%!

FROM FOREST TO BOULEVARD

On the James Spencer & Son job near Laurel, Miss., 12½ miles of modern highway are being cut through forest and swamp. Stumps are blasted, pulled with tractors, piled and burned. A channel is cut along one side of the 200-foot right-of-way for drainage (left.) An Allis-Chalmers "WK" Tractor is shown.

ALLIS-C

TRACTOR DIVISION

HIGHWAY PROGRAM

DIRT FLIES IN MISSISSIPPI

UPPER RIGHT: One of the Allis-Chalmers Model "L-O" Oil Tractors and 10-yard Gar Wood Scrapers on Highway 15 job of James Spencer & Son Construction Co., near Houston, Miss. The Gar Wood proves itself a "honey" for finishing.

UPPER LEFT: On their job near De Sota, Miss., Chickamauga Construction Co. use two Model "L-O" Oil Tractors and a "WK" with Baker Bulldozer. They have 13 bridges in 12 miles. Water seeps in and fills borrow pits.

CIRCLE: Model "L-O" Oil Tractors step along fast with 10-yard Gar Wood Scrapers on Spencer's job near Stewart, Miss. 12 miles of grading, drainage and bridges on U. S. 82

LOWER RIGHT: This scene on U. S. 82 is near Itta Bena, Miss. Shuptrine Construction Co. is the contractor. Unit shown is an Allis-Chalmers "L-O" and Gar Wood Scraper.

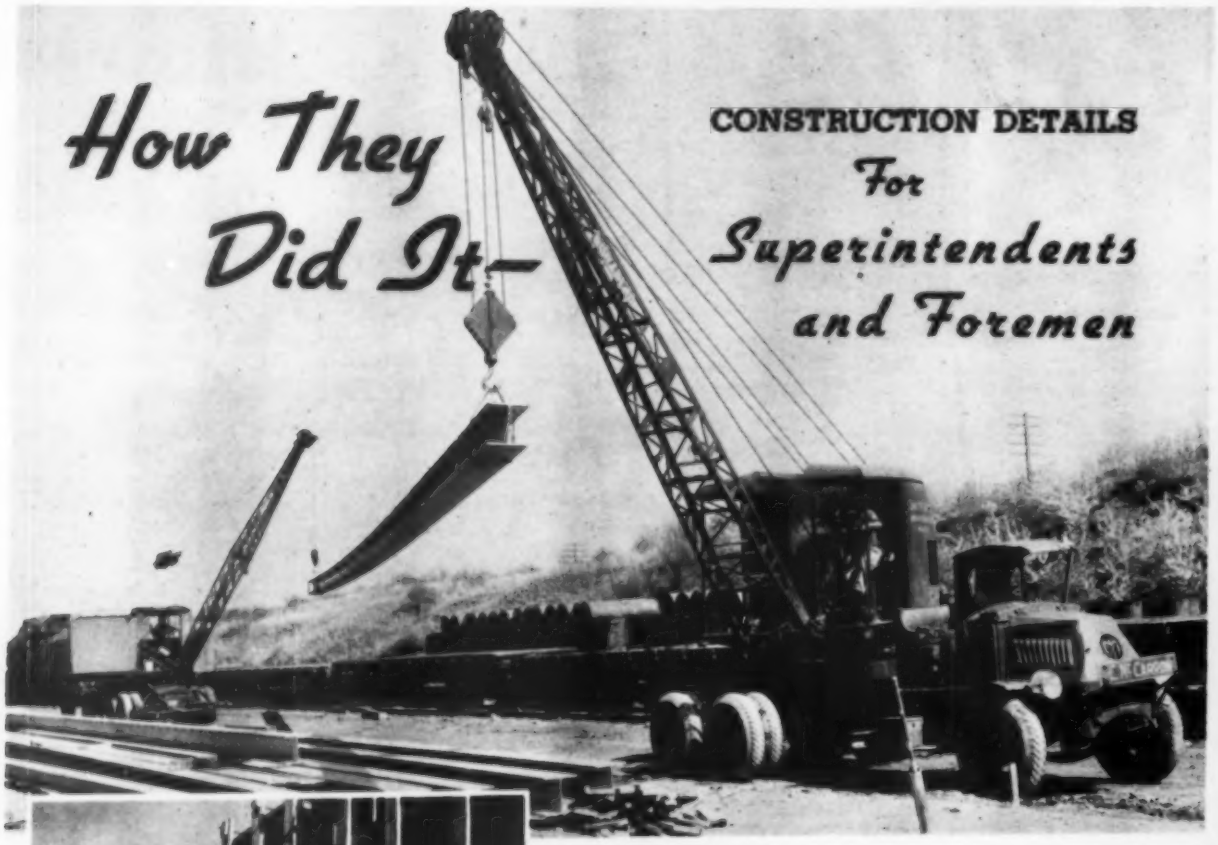
SCHALMERS *Controlled Ignition* **OIL TRACTORS**

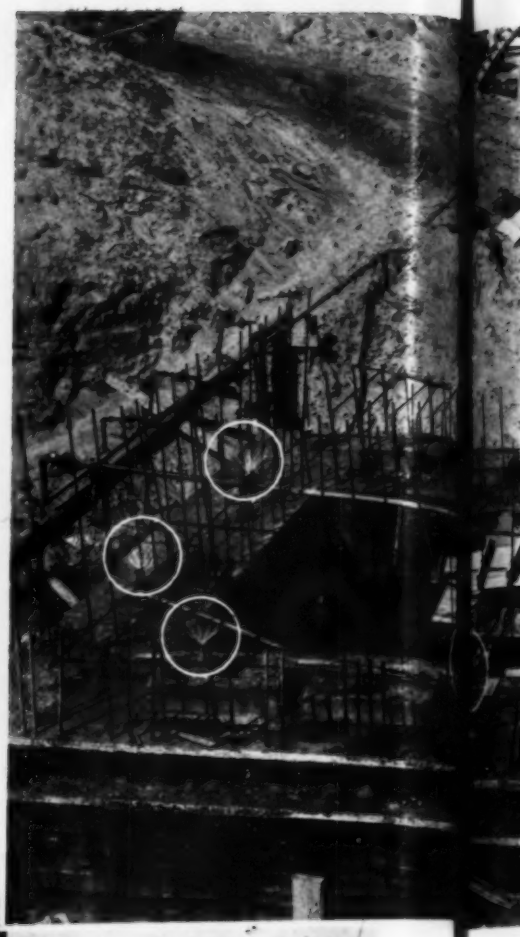
...TIMED RIGHT TO FIRE AT THE RIGHT TIME

SION—MILWAUKEE, U. S. A.

How They Did It—

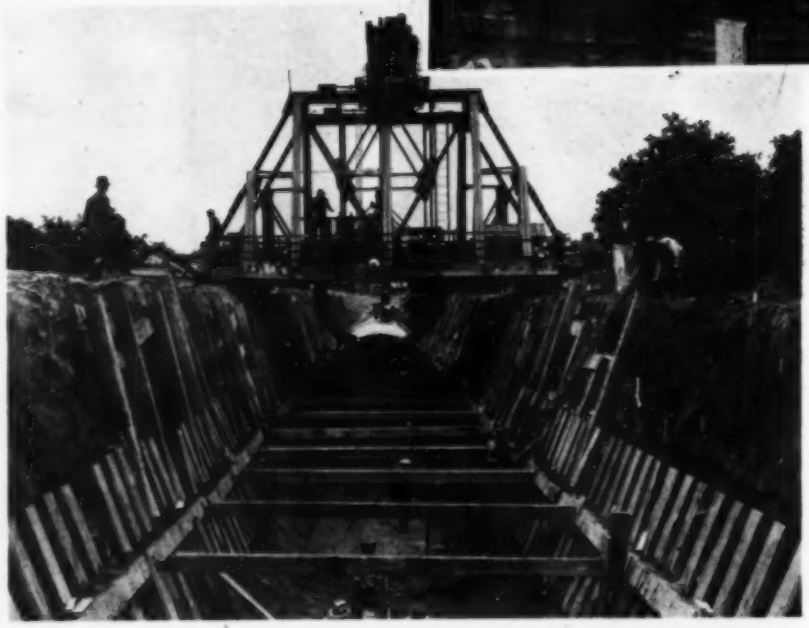
CONSTRUCTION DETAILS For Superintendents and Foremen





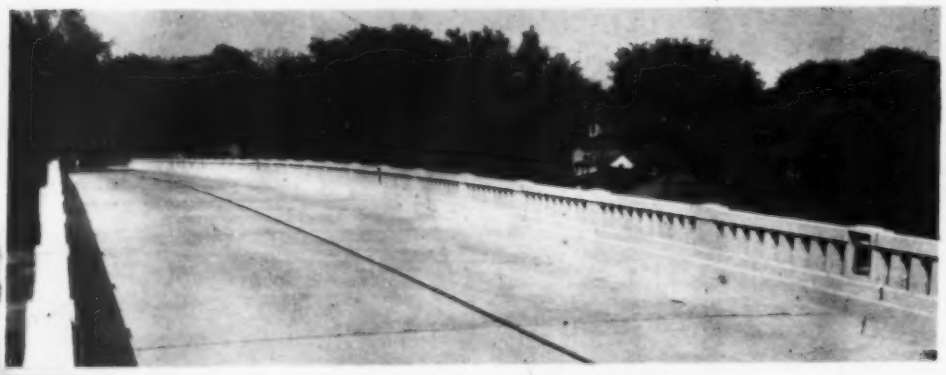
TRUCK-CRANE TEAMWORK

facilitates unloading at sorting yard of steel poles 40 to 130 ft. long for electrification of Pennsylvania R. R. between Paoli and Harrisburg, Pa. Two Universal - Lorain units owned by Charles McCarron and Vare Construction Co., of Philadelphia, hoist, swing and lower long poles, weighing up to 11 tons, by close cooperation between crane operators, who control and synchronize movements of trucks by system of whistle signals to truck drivers.



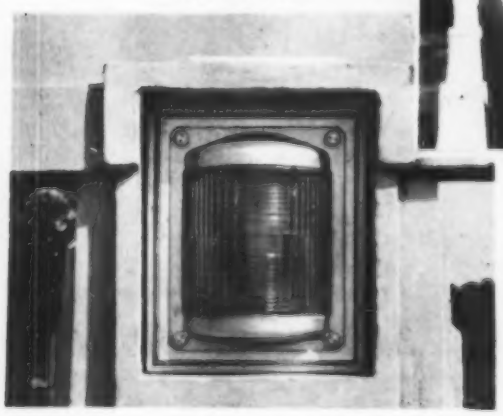
DRIFTER DRILL

set up in wagon mounting puts down grout holes as deep as 80 ft. in pink granite, using coupled drill rods and detachable bits, at Buchanan dam on Colorado River of Texas, where R. B. Alsop, superintendent for Lower Colorado River Authority, built rig to test utility of drifter for this work.



ROLLING GANTRY

unloads from trailer and places in trench 10-ft. 8-in.-diameter precast concrete pipe sections 10 ft. long on distribution main, north and west of Cajalco dam, of Metropolitan Water District of Southern California. J. F. Shea Co., Inc., is contractor for this portion of main near Claremont, Calif.



RECESSED LIGHT UNITS

set into concrete posts of handrail *(left)*, short distance above roadway crown, provide non-glare illumination for night driving on new viaduct at Van Buren, Ark., and discourage vandalism by exposing as little of units as possible. Lighting system consists of 22 Crouse-Hinds units equipped with 200-watt bulbs and recessed 6-in. in alternate railposts on two sides of bridge *(above)*. Each unit is adjusted for relative position on grade and vertical curve and is placed to avoid overlap with angles of light from adjacent units. Light units are not visible to approaching drivers more than 50 ft. distant. System completely illuminates 30-ft. roadway with soft, efficient light. Fred Luttjohann, Topeka, Kan., contractor.—*Photos from* L. A. McCAIN, *resident engineer, Arkansas Highway Dept.*

CURING OF CONCRETE

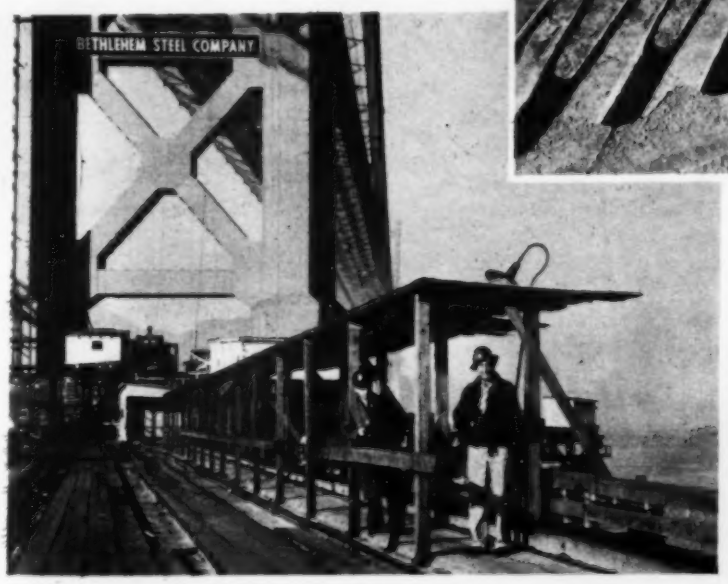
on Mississippi River Lock No. 25, at Cap au Gris, Mo., is done with aid of sprinklers on temporary pipe lines laid on surface of freshly poured concrete. Work is under direction of U. S. District Engineer Office at St. Louis, Mo.

TO BEND PIPE

into conformity with trench contours on 14-in. Cabot gas line running from Northern Pennsylvania to Rochester, N. Y., I. C. Little, of Dallas, Tex., uses two Trackson pipe-laying cranes. One unit straddles trench and holds down pipe under semicircular block while second crane raises free end of line. Steel pipe takes desired curve.

ROOM FOR EXPANSION

is provided by cast-steel finger joints in concrete deck of new Kingshighway bridge, St. Louis. Joint measures 17 in. between bases of slots, while fingers are 12 in. long.



ROOFED WALKS

under deck of Golden Gate bridge, San Francisco, protected workers from falling rivets or tools during construction.

MODERN BITUMINOUS PAVING PRACTICE

is exemplified by Michigan Asphalt Paving Co., Royal Oak, Mich., in building 21½ mi. of asphaltic concrete on Michigan State Road 55 between Manistee and Cadillac. SELF-PROPELLED SPREADER *(below)* receives asphaltic concrete mixture in charging hopper and distributes it uniformly across width of roadway by means of worm conveyor and strikeoff screed. Machine rides on 3½-in. forms set to true pavement grade. Special gasoline-powered roller equipped with three tandem wheels follows spreader. MECHANICAL SUBGRADER *(left)* riding on temporary steel forms trims fine grade for pavement. Machine carries ramps to permit passage of trucks.

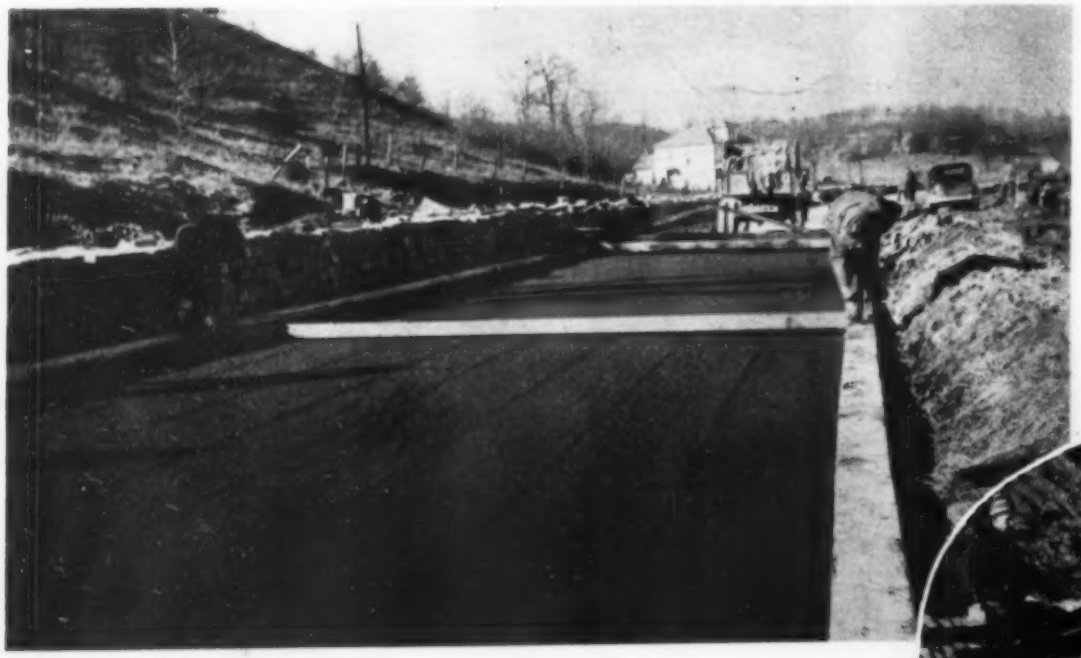
WANTED — Photos of Details

The Editor of CONSTRUCTION Methods and Equipment wants photographs or sketches illustrating interesting DETAILS of method or equipment and will pay for those he finds acceptable for publication.

Hasn't your job produced some DETAIL that might be illustrated on this page? Send along a picture of it; we'll return it promptly if we can't use it.

Ohio Lays Longitudinal Brick on Experimental Paving Project

MASTIC CUSHION mixed in plant at Columbus, Ohio, and trucked 42 mi. to job is struck off to ¾-in. depth by trussed templet equipped with compensating carriages riding on concrete curbs.



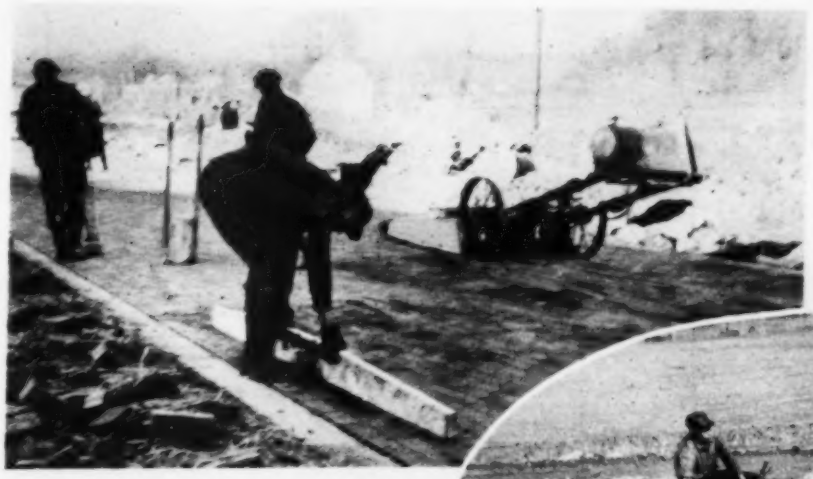
SPECIAL SCRATCH TEMPLET marks bed into nine lanes to facilitate spacing and aligning of longitudinal brick courses.

LAYING BRICK LONGITUDINALLY *(right)* permits large number of droppers to work, speed of operation being restricted only by ability of following crews to keep up with brick laying.

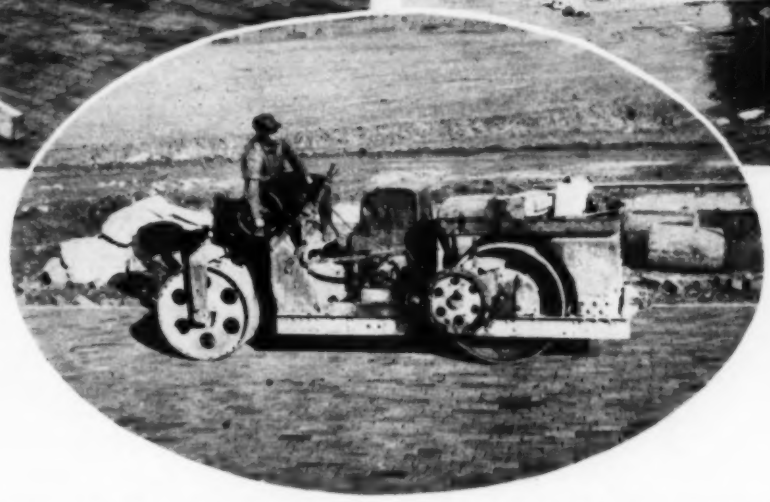
IN LAYING longitudinal brick courses on an experimental project 1.35 mi. in length 42 mi. southeast of Columbus, Ohio, last fall, Beightler & Hussey, of Columbus, produced a neat-looking and smooth-riding pavement despite difficulties arising out of inexperience with this type of brick surface, which was new both to the contractors and to the engineers of the State Department of Highways. Longitudinal laying offered opportunity for employment of a large number of droppers, with resulting increased speed of construction, but it presented problems in aligning and spacing the brick courses. Lack of uniformity in brick sizes, unavoidable in the manufacture of the product and permitted by state specifications within certain tolerances, caused occasional variations in the number of courses laid between curbs and, in addition, presented some difficulty in breaking transverse joints at the centers of the brick, as specified.

VARIATION IN BRICK DIMENSIONS causes occasional change in number of rows laid between curbs, requiring closures with bats next to curb at transitions.

Brick Surface — On a concrete base of 7-in. uniform thickness with a total width of 20 ft., including integral curbs 9 in. wide and 3½ in. high, the contractors spread a ¾-in. mastic cushion in the 18½-ft. space between header curbs and laid 3x4x8½-in. wire-cut vertical fiber lug brick in longitudinal courses 3 in. deep. Brick varied in width from 3¾ in. to 4¼



SURFACE SMOOTHNESS is tested during construction with longitudinal straight-edge. In background is surface heater used to heat brick before applying filler in cold weather.



MOVING PARALLEL WITH CURBS, small roller beds brick in mastic cushion.

EXCESS JOINT FILLER is removed from surface, leaving clean anti-skid pavement. Surface is covered with lime whitewash prior to application of filler.

in. and in length from 8¼ to 9 in. With lug brick 4 in. wide it was possible to lay 54 courses in the 18½-ft. space between curbs. Because of variations in brick sizes the contractors laid 53 courses on major portions of the project, in addition to short sections completed with 54 or 52 courses. Changes in the number of rows required special closures adjacent to one curb at ten transitions in the 1.35 mi.

Spacing Brick — To aid proper spacing of brick across the width of the roadway, the engineers designed special scratch templets with finishing nails protruding from the bottom far enough to make distinct marks in the mastic cushion. The templets were drawn forward on the curbs, marking the bed into nine lanes to guide the brick droppers. Eight lanes were made 25⅛ in. wide to take six brick of average size, and the ninth, or center, lane was made 21 in. wide to take five brick courses. The markings on the cushion improved the appearance and workmanship of the job by keeping the rows in alignment and averting final re-spacing of brick across the entire width of pavement to take up gaps remaining next to the curb after the last row of brick had been placed.

Several methods were tried to obtain speed in laying brick. Laying from both sides toward the middle was given up as unsatisfactory. The contractors started out using a roller conveyor to deliver brick to the droppers, as had been their habit on transverse laying, but quickly abandoned this method. Brick then were carried in by man power, using tongs holding five brick.

Direction—Construction of the experimental paving project was directed for the Ohio Department of Highways by Boyd V. Wright, resident engineer. For Beightler & Hussey, Columbus, Ohio, the contractors, operations were under the direction of V. N. Holderman, superintendent.

Photos, American Wood Preservers' Association

Composite Timber-Concrete Slabs
Form Highway Bridge Decks

SPECIAL TOOL *(right)* cuts slots for shear developers under blows of 8-lb. sledge.

AT LEAST FOURTEEN BRIDGES in the United States have composite laminated timber-concrete decks consisting of timber slabs, full roadway width, built up of 2-in. dressed creosoted plank laid longitudinally and covered with a concrete wearing surface which is effectively connected to the lower timber portion of the slab by means of small steel plates known as shear developers. The bridges nearly always have uniform span lengths of 20 ft., but some of the structures run to great overall lengths, from the first one of this type, 3,200 ft. long, built across Tampa Bay, Florida, in 1933, to a 1,300-ft. bridge now under construction across the South Branch of the Savannah River, near Savannah, Georgia.

Shear developers are usually isosceles triangles, with 3¾-in. sides, stamped from 3/32-in. steel plate. Their function is to prevent any slippage between the two materials along the junction plane and to develop horizontal shearing stresses which enable the concrete wearing surface to be utilized as an integral part of the slab. In constructing the laminated timber slab, alternate planks are raised 2 in. above intermediate planks, leaving grooves into which the triangular shear developers are driven, as illustrated. The concrete top forms the compression portion of the homogeneous slab.

LAMINATED TIMBER SLAB made up of 2x8-in. dressed and creosoted plank running longitudinally forms lower portion of homogeneous deck combining timber and concrete wearing surface. Alternate plank, raised 2 in., are filled in at bottom with blocks above bent cap.

SHEAR DEVELOPERS *(right)* are triangular steel plates driven with small sledge into slots cut in sides and bottom of grooves in laminated timber slab.

Planning and Plant for

TWENTY-FIRST OF A SERIES OF ARTICLES

HEAVY CONSTRUCTION

Principles and Practices of Job Layout and Selection and Use of Equipment

ADOLPH J. ACKERMAN and CHARLES H. LOCHER
Construction Plant Engineer TENNESSEE-VALLEY AUTHORITY, KNOXVILLE, TENN. *Construction Consultant*

• 21 •
Cement Handling

FOR LARGE CONSTRUCTION OPERATIONS cement is now almost invariably delivered in bulk, either in special hopper-bottom cement cars of the covered gondola type or in box cars carrying about 245 bbl. per car. Hopper cars are most satisfactory because they provide the simplest and cheapest means for unloading, and do not require men and special equipment to be located in the dusty atmosphere which is found in box cars. Cement hopper cars are available only in limited numbers in the northeastern part of the United States, and until they are more generally available it will be necessary on certain jobs to continue using the more expensive methods of unloading from box cars.

The car unloading methods listed in the accompanying table are used in modern practice.

Box cars require special timber bulkheads to confine the cement and keep it clear of the car doors. Where the cement is unloaded by scraper scoops into a hopper located alongside the car the bulkheads are usually set on the inside parallel to the car doors, whereas with a portable unloader it is better to install the bulkheads at the cement mill to span the width of the car, so that upon opening the cars there is a section of open floor space on which to set the unloader. A removable board at the base of the bulkhead provides a simple means for drawing out the cement until the bulkhead is clear and can be removed.

Where the unloading of cars is intermittent it is generally desirable to feed directly into a silo of considerable capacity so that the transporting system to the point of use is made independent of the unloading system, thereby raising the output and efficiency of both systems. Steel silos with steeply sloping cone bottoms are most satisfactory and have largely displaced wood stave silos or sheds.

For certain operations on a large job it is necessary to have a supply of cement in bags so that it can be readily transported to special points of use, such as grouting operations in treating the foundations.

At Madden dam cement was delivered from the United States to the Panama Canal Zone in paper bags built up of five plys with one ply specially treated with paraffin to keep out moisture during transit. From the ships the bags were loaded into box cars and delivered to a siding near the dam site. Here the bags were unloaded manually on to a belt conveyor which ran to a special chute equipped with steel knives. In dropping through the chute the paper bags were cut on all sides and landed in a revolving screen which thoroughly shook out the cement and dropped it into a collecting hopper. A Fuller-Kinyon pump located below this hopper delivered the cement into a steel silo with a capacity of 6,000 bbl. The proper scheduling of cement deliveries for such an operation is of considerable importance, and in the case of Madden dam was carried out very effectively.

Cement Conveyors and Pumps

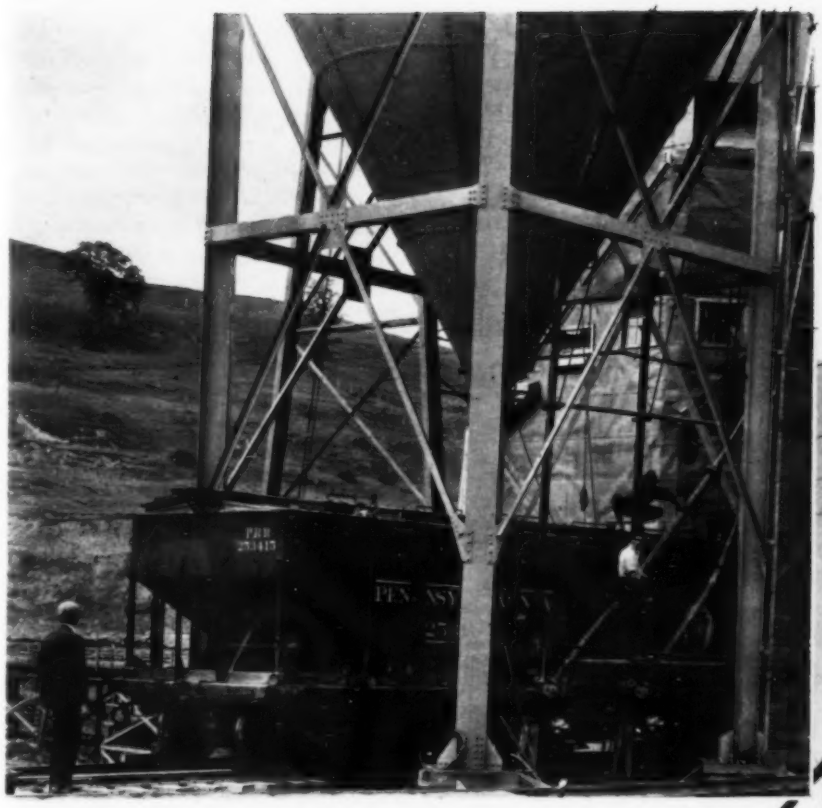
The bucket elevator for raising cement into a silo is one of the cheapest methods and was employed on the Chickamauga and Guntersville projects because it was possible to bring the railroad cars directly to the base of the silo. A portable unloader with a capacity of 175 bbl. per hour delivered the cement into a hopper from which the bucket elevator raised the cement into the silo or directly into the mixing plant. The elevator, rated at 160 bbl. per hour, was 103 ft. high and was composed of buckets with a capacity of 0.33 cu.ft. each, which traveled 120 ft. per minute and were driven by a 25-hp. motor. The entire unit was inclosed in a housing and weatherproofed. The average actual performance of this elevator was 89 bbl. per hour of gross time, or 121 bbl. per hour of net running time. A steel silo adjacent to the mixing plant had a capacity of 4,000 bbl. Normally, as much cement as possible was elevated directly into the mix-

PORTABLE CEMENT UNLOADING PUMP of Fuller-Kinyon design transfers bulk cement from box car to storage silo at Norris Dam.

AUTOMATIC REMOTE CONTROL operates another type of Fuller-Kinyon portable cement pump for unloading bulk cement.

Car Unloading Methods

TYPE OF CAR	UNLOADING METHOD	TRANSPORTING METHOD TO STORAGE	SPECIAL FEATURES
Box Cars	Scoop pulled by cable, guided by hand, pushing cement into a hopper alongside car door.	1. Screw conveyor	For short horizontal distance
		2. Bucket elevator	For vertical conveying
	Portable unloader pumping direct into a silo, or into a hopper feeding a bucket elevator.	3. Fuller-Kinyon pump	For lift and distance
		4. Robinson conveyor	
		5. Fluxo conveyor	For great distance
Hopper Cars	Gravity feed directly into	Transporting Methods No. 1, 2, 3, 4 or 5	Most simple and economical



SPECIAL HOPPER-BOTTOM CEMENT CAR discharges cement intermittently into underground tanks from which it is pumped pneumatically into silo overhead.

ing plant, and only about 15 per cent of the total cement went through the silo as reserve storage. Approximately 11 cars per day were unloaded, at a rate of 1.75 hr. per car. The bucket elevator had a relatively low repair cost; unloading cost for operation and equipment depreciation was 7c. per barrel.

Inclined belt conveyors have been used on some jobs in the past, but such methods are now considered obsolete. For certain special cases a vertical screw conveyor has been developed. Such a screw is housed in a steel tube, has a flat pitch angle and runs at sufficiently high speed to deflect the cement upward.

The Fuller-Kinyon pump consists essentially of an electric motor driving a heavy-duty screw within a steel housing, the screw feeding the cement forward into an aeration chamber where air is supplied at a pressure of 30, 40, or 50 lb. per square inch, depending upon the duty of the pump. This equipment aerates the cement just enough to make it "fluffy" and furnishes the necessary pressure for propelling it forward through a steel pipe usually from 4 to 6 in. in diameter. These pumps are available for stationary mounting, as under hoppers or connection to hopper-bottom cars, or as portable unloaders equipped with a special pick-up feeder and mounted on wheels for "sweeping up" bulk cement in box cars or barges. A flexible hose connects the unloader to the main transport line. Portable unloaders are made in capacities of 10, 20, 30, and 40 hp., using 3- to 5-inch diameter transport lines, the size depending on length, capacity and general layout. Stationary pumps are available in sizes from 4 to 10 in. for transport lines ranging from 2½ to 12 in. in diameter.

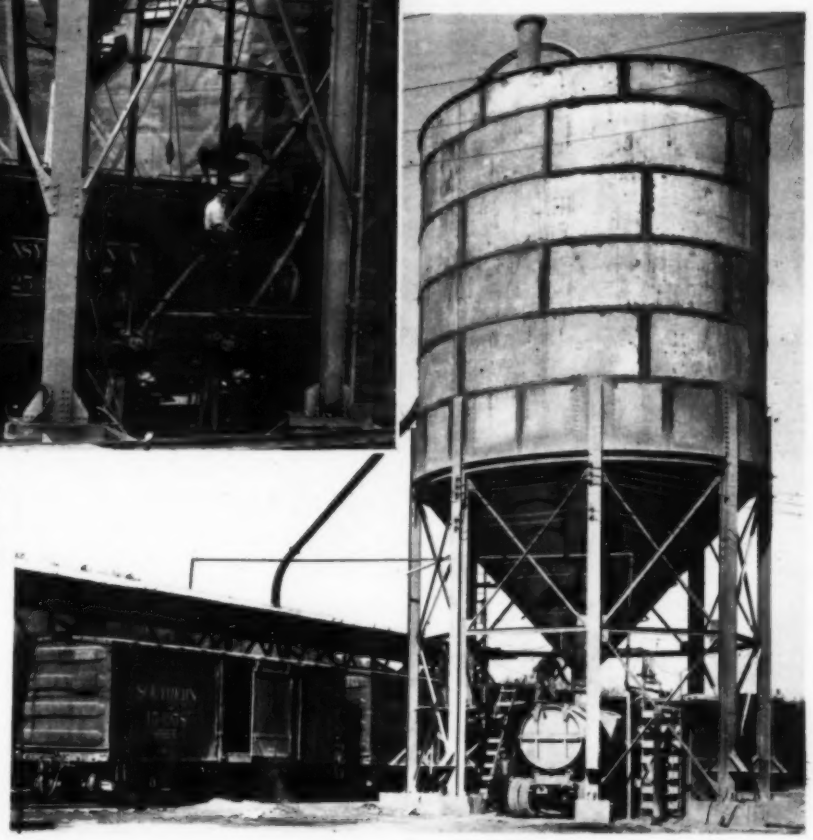
At Pickwick Landing dam the cement was received in steel barges having a capacity of 1,500 bbl. each, and was unloaded by a 5-in. portable unloader, rated at 100 bbl. per hour, and a 6-in. unloader handling 149 bbl. per hour. These unloaders were driven by 40-hp. motors. The 6-in. pump used about 357 cu.ft. per minute of air, delivering cement a distance of 330 ft.

A 5-in. stationary pump was employed at Morris dam, Pasadena, Calif., to transmit cement through 730 ft. of line sloping upward with a rise of 302 ft. This is one of the record installations on construction work, and delivered cement at a rate of about 125 bbl. per hour. Pumping distances of 3600 ft. have been reported with this type of equipment.

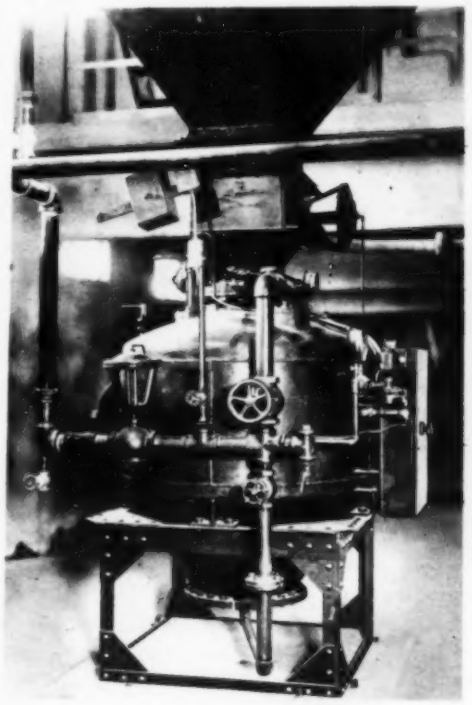
The automatic remote control unloader is a new development which permits the operator to stand at an advantageous position without getting into the dusty part of a car. The movements and direction of travel of the unloader are controlled entirely through an electric cable. When the feed is too great, the feeder automatically stops but cement pumping is continued, and the operator can then draw back the unloader and reduce the load to a point where it will operate satisfactorily.

The air requirements for a cement handling system run approximately as shown below (the pressures ranging from 30 to 50 lbs. per square inch).

In the Robinson system the cement is drawn off from a silo, hopper or direct from hopper cars into a steel aeration tank with a capacity of approximately 50 bbl. When the tank is filled, air is injected through a special arrangement of pipes, and the aerated cement is directed into a collecting horn connected to the pipe line through which it is transmitted to the desired storage points. A typical operation required



CEMENT STORAGE SILO of 6,000-bbl. capacity at Norris Dam railroad terminal has pipe lines running from car unloaders to top of silo. Cement truck is being loaded below.



HIGH-CAPACITY CEMENT CONVEYING UNITS of Fluxo type are used at Boulder and Grand Coulee Dams.

Air Requirements for Cement Handling System

Pumping Distance, Ft.	*Cu.Ft. of Air Per Bbl. of Cement*	*Cu.Ft. of Air Per Min. for 100 Bbl. Cement Per Hour*
250	75	120
500	100	180
750	125	220
1000	155	280
1500	200	340
2000	240	390

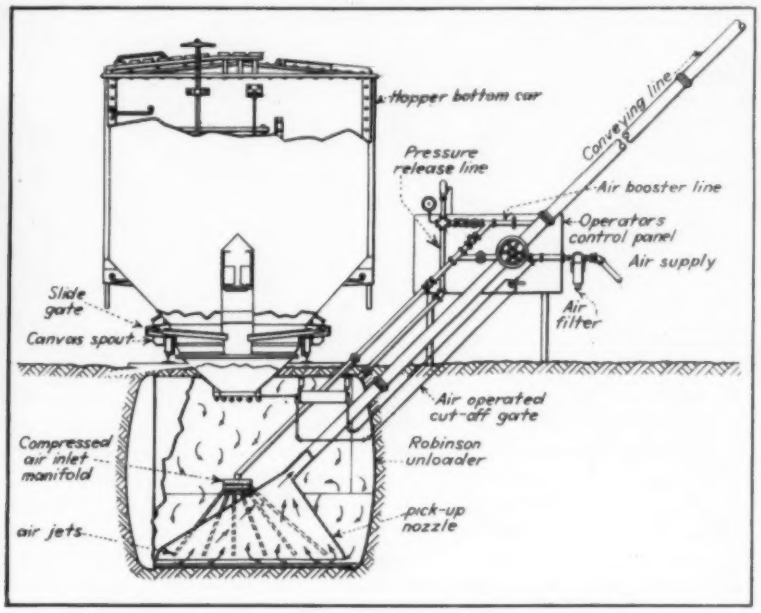
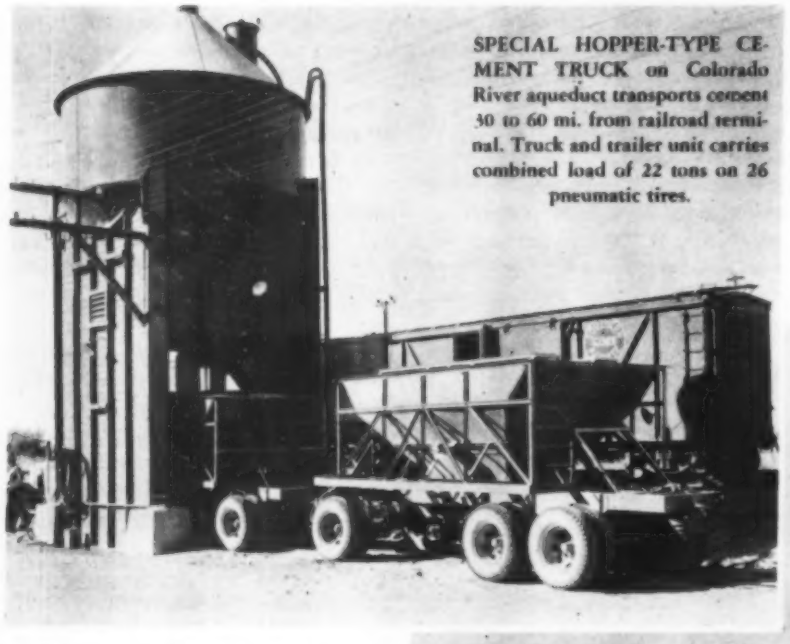


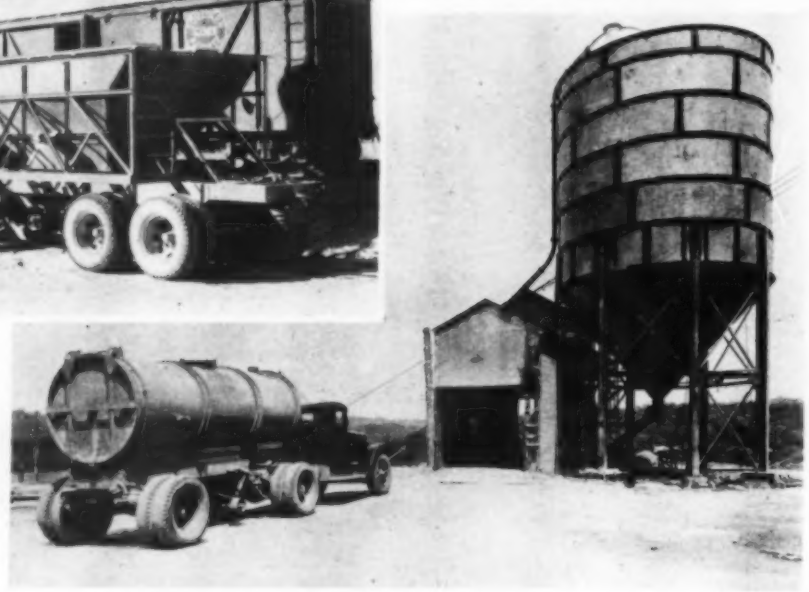
DIAGRAM of Robinson cement transporting system. Tank is filled with cement, then aerated. Air pressure propels cement through pipe line to bin or storage silo.



SPECIAL HOPPER-TYPE CEMENT TRUCK on Colorado River aqueduct transports cement 30 to 60 mi. from railroad terminal. Truck and trailer unit carries combined load of 22 tons on 26 pneumatic tires.

about 10 sec. to fill the tank, and 50 sec. to charge it with air. Once the tank is completely charged, the discharge line is opened and the cement blown out into the transport line, which requires about 5 min., or a total cycle of 6 min.

The Robinson system was at one time operated manually, particularly in the manipulation of valves, but more recently the conveyor has been made automatic through the use of electric relays and air valves. A 550-ft. length of line with a rise of 110 ft. can handle about 200 bbl. per hour. This system can be used with 4-in. lines up to 1,500 ft.; with 5-in. lines distances up to 3,000 ft. are claimed. At Pickwick Landing dam cement was transmitted a distance of 1,200 ft. from the storage silo to the mixer plant. For this installation two tanks, each 6 ft. in diameter by 7 ft. long, were used, one operator handling both tanks. The filling and discharging for one tank was done at the rate of 10 shots per hour, handling 200 to 240 bbl. per hour, and with two tanks 12 to 13 shots per hour, handling 240 to 290 bbl. per hour. The second tank served primarily as a standby. In the event of pipe plugs, it has been found possible at Pickwick to release such plugging without the need of removing the line by applying pressure and making a sudden release which has a tendency to pull the cement down and in that manner break up the plugs. The line is normally kept blown out and empty when not in use.



ALUMINUM CEMENT TANK mounted on truck transports cement from railroad terminal 5 mi. to Norris Dam site. Trucks are dumped by overhead hoist located in terminal shed. Receiving hopper and cement pumps located below ground level deliver cement to top of silo, and return spout at bottom of silo delivers cement to same pumps for transporting to mixer plant.

The differences between the Fuller-Kinyon system and the Robinson system are chiefly in that the former has a motor driven rotating element and requires a constant supply of air at from 30 to 50 lb., (sometimes 15 to 20 lb.), while the latter has few moving parts and requires an intermittent supply of air at about 100 lb. pressure.

It is very important that air used for transporting cement be as dry as possible, and for this reason an aftercooler and moisture trap should be employed. Only the usual standard devices for drying air are needed to make it satisfactory for cement handling. The discharge end of a cement transport line demands special consideration. Suitable dust separators are essential so that a minimum of cement is carried out by the exhaust air. This is extremely important and if not properly designed will lead to a substantial loss of cement. Certain so-called "simple" but makeshift devices have not always been found satisfactory. For large plants the dust separators should be of first-class proved design with means for cleaning them periodically.

For certain special conditions of long distance and high capacity transportation of cement, as was needed on the Boulder and Grand Coulee dam projects, the Fluxo system has been successfully used. At Boulder dam cement was pumped 5,420 ft. through 9-in. pipe at rates up to 550 bbl. per hour. The average rate was more nearly 450 bbl. per hour, which required 2,000 cu.ft. per minute of air at 90 lb. pressure. A 2-in. air line ran parallel to the transport line and tapped into it every 200 ft., with a valve in each tap to assist in blowing out cement in the event of a plugged line.

The same equipment was later transferred to Grand Coulee dam and set up initially to pump 600 bbl. per hour through 2,000 ft. of 11-in. pipe. After a second mixer plant was installed the total pumping distance to it was 6,200 ft. The transport line discharged into special expansion tanks in which the cement was separated from the air and drawn off into the mixing plant bins.

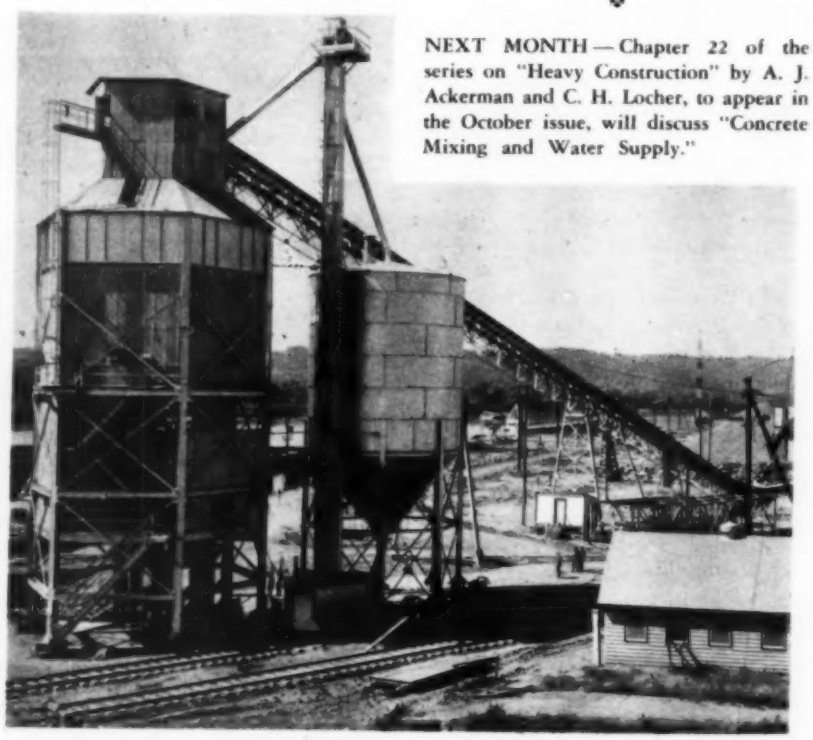
The Fluxo pump consisted of two 50-bbl. capacity tanks. The tanks are alternately filled by gravity from an overhead bin and discharge alternately to maintain a reasonably steady flow in the transport line. The cement is thoroughly aerated within the tank and then forced into the line by air pressure. Control of filling and discharge valves is automatic through electric relays. Smaller Fluxo pumps are available for lower capacity installations and pumping distances of 1,500 to 4,000 ft.

Cement Haulage by Trucks

The trucking of cement is generally handled in special types of truck bodies as shown in the illustration, either of the round type as used at Norris dam, (capacity 60 bbl.), or in the form of hoppers as employed on the Colorado River aqueduct, so that the cement can be drawn directly into hoppers below the trucks without special dumping or body-lifting devices. For the 13-mi. run from the railroad siding to the site of the Madden dam, standard rear-dump trucks were employed with steel bodies of special type made exceptionally light but heavy enough to carry cement and having a capacity of about 60 bbl. These bodies had watertight covers equipped with filling holes. The covers could be removed when it was desired to convert the bodies to other service, but this feature did not prove advantageous, because of difficulties in keeping the body watertight. Unless only a small quantity of cement is to be handled, it is better to design a cement body for one particular purpose.

❖

NEXT MONTH — Chapter 22 of the series on "Heavy Construction" by A. J. Ackerman and C. H. Locher, to appear in the October issue, will discuss "Concrete Mixing and Water Supply."



VERTICAL BUCKET ELEVATOR at Guntersville Dam delivers cement to mixer plant or to 4,000-bbl. storage silo. Box cars carrying cement in bulk are spotted at base of bucket elevator, and cement is unloaded into receiving hopper by portable unloader.

CORRECTION—In making up Chapter 19 of the series on "Heavy Construction," published in CONSTRUCTION *Methods and Equipment* for July, 1937, captions (both beginning with the words "concrete pier") for the illustrations at the bottom of p. 65 and at the top of p. 67 were transposed and should be interchanged. The pier illustrated on p. 65 is the one sunk through an artificial sand island at New Orleans while the pier shown on p 67 is for the San Francisco-Oakland bridge.

Present and Accounted For

A PAGE OF

Personalities

KANSAS HIGHWAYS

are built and maintained today under direction of A. B. NUSS, who recently succeeded H. D. Barnes as state highway engineer. Mr. Nuss formerly was chief engineer of WPA for Kansas.

BUREAU OF RECLAMATION

acquires new executive in central office as ROY B. WILLIAMS moves from All-American Canal and Gila project in California and Arizona to assignment as assistant commissioner in Washington, D. C. Born in Beattyville, Ky., in 1888, Mr. Williams was graduated in civil engineering from Montana State College in 1911 and entered reclamation service as surveyman on Flathead project in 1912. He has worked on Sun River and Kittitas projects and on construction of Boulder Dam.

DEAN OF ENGINEERING SCHOOL

at Texas Agricultural and Mechanical College is new post accepted by GIBB GILCHRIST *(left)*, for last 12 years state highway engineer in charge of Texas State Highway Department. Mr. Gilchrist assumed duties of present office Sept. 1.

UTAH'S HIGHWAY PROGRAM

responds to direction of EZRA C. KNOWLTON *(above)*, appointed chief engineer of State Road Commission to succeed K. C. Wright, resigned. In former positions with State Road Department, Mr. Knowlton served as district engineer, maintenance engineer and assistant chief engineer.

NEW YORK CITY BUILDERS

comprising superintendents, foremen and mechanics in carpentry and masonry trades enrolled in student course at Delehanty Institute inspect clay tile refractories in New Jersey under leadership of C. KEHOE *(in inset)*, instructor. At South River plant of William F. Kenny Co., students and guests line up near kilns with F. E. EMERY, secretary-engineer of Eastern Structural Clay Tile Association.

AMONG THOSE IN GROUP ARE:

(1) W. H. Sypher (a guest)
(2) Thomas Conlon
(3) Joseph Modica
(4) Charles Suishling
(5) M. S. Chorrowsky
(6) William Battista
(7) T. Carrington
(8) F. E. Emery
(9) Arnold Saggese
(10) Irving Hoffman
(11) John Hencke
(12) A. A. Baen
(13) D. C. Faddis
(14) L. H. Golden
(15) J. A. Lopez
(16) S. Rosentaub
(17) W. Zacharkow
(18) C. B. Bellew
(19) L. J. Flanagan
(20) Simon Mills
(21) P. O. Cahill
(22) Frank Balaka
(23) John Annett
(24) Patrick Hannon
(25) Harold Swallow
(26) Thomas Ashley
(27) G. J. Van Water
(28) Anthony Oewn
(29) M. A. Pangera
(30) J. F. Flanagan
(31) Jack Murphy
(32) Harry Doherty
(33) J. B. Digney
(34) Frank O'Donnell
(35) P. O'Neill
(36) T. J. Brennan
(37) William Wood
(38) William Horne

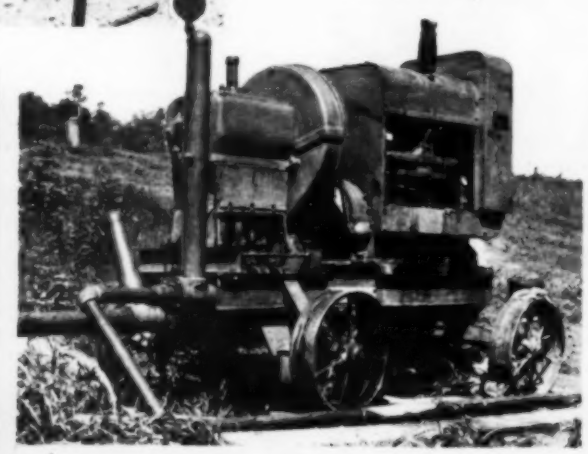
Construction Equipment News

(All rights reserved)

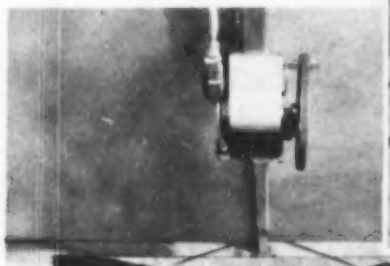
Review of Construction Machinery and Materials for September, 1937

MIX-IN-PLACE ROAD BUILDERS (left) for bituminous pavements, are self-propelled for heavy retread and stabilized bases and tractor-drawn for light retread operations. Each type incorporates (1) twin or triple pug mill mixing unit which mixes binder and aggregate in one continuous controlled operation, permits use of heavier, quicker curing binder and allows earlier rolling; (2) spreader-finisher unit which lays out smoothly finished surface ready for rolling. Entire mixing and finishing operation accomplished in one pass, eliminating time and cost of blading and insuring more uniform spread and accurate strikeoff. One man at rear controls does entire job. May be used without spreader finisher as traveling mixing plant and with addition of bin and feeder belts in temporary plant set-up. Photo shows self-propelled unit operating as traveling mixer, cutting scarified roadway to staked grade and depositing mixed material for 5-in. base in wide windrow behind machine. — **Jaeger Machine Co., Columbus, Ohio.**

TRIPLEX ROAD PUMP (below) for producing adequate water supply for mixing and curing concrete pavement is rated at 80 g.p.m. at 500-lb. pressure or 125 g.p.m. at 325-lb., but when powered with 50-55-hp. engine will deliver 100 g.p.m. at 600 lb. or 75 g.p.m. at 800 lb. Vertical type unit with crankshaft at top and water end at bottom prevents damage to plungers by sediment passing through water passages. Fully inclosed and self-oiling. Other advantages claimed: (1) single gear reduction increases mechanical efficiency; (2) proper valve design gives high hydraulic efficiency; (3) lower fuel costs; (4) less parts; lower maintenance; (5) noiseless — long life helical gear drive; (6) unusual accessibility to working parts. Water end may be removed in case of bursting due to freezing without dismantling pump.—**Gorman-Rupp Co., Mansfield, Ohio.**



ELECTRIC GARAGE DOOR OPENER (below) operates either by flashing of car headlight upon photo-electric eye or from switch mounted on post at side of driveway within reach of car window. Use of device opens garage door and switches lights on, enabling operator to drive in without leaving car. Second manually operated switch placed inside home opens and lights garage and closes it as desired, disconnecting driveway switch or photo-electric eye. Headlights function with eye either in sunlight or at night. May be fitted to any type of door being available in three types for this purpose: Vertical for vertical openings, hinged for one pair of swinging hinged doors and double-hinged for two pairs of swinging hinged doors. — **R. W. Seed Manufacturing Co., Lawrence & Eagle Roads, Upper Darby, Pa.**

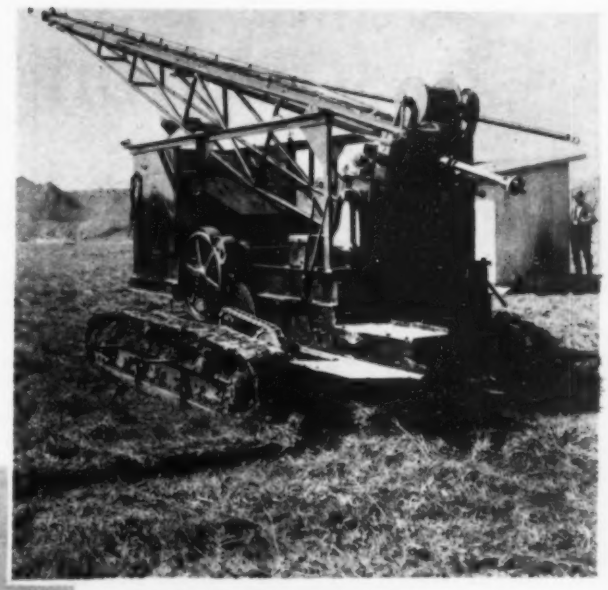


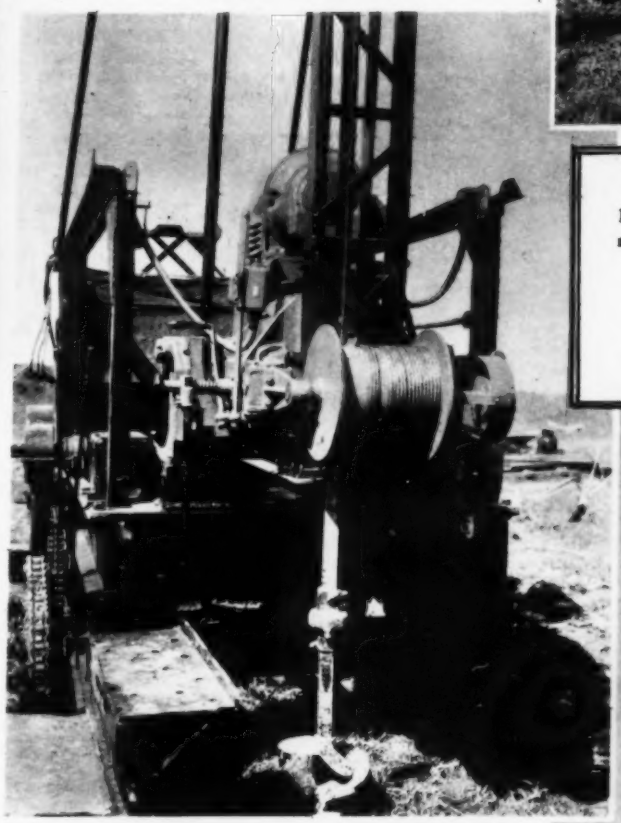
ELECTRIC HAMMER is equipped with universal motor which permits use on portable electric generator as well as on large central station supply lines and with a.c. or d.c. current. Although current supply is limited motor delivers action as powerful as when operating from central station supply line.— **Black & Decker Mfg. Co., Towson, Md.**

ELECTRO-MAGNETIC CRANE (below) consisting of Michigan convertible truck unit and electro-magnet powered by special generator mounted in cab and driven by truck motor will unload carload of pig-iron in about 1½ hr. From six to eight 60-lb. pigs can be handled in one pass at speed of six passes per minute giving crane capacity of 2,100 lb. or more per minute. Capacity of crane handling flat materials under ideal conditions, 5,000 lb. Crane boom of lattice-type construction furnished in lengths up to 40 ft. with jib extension. Full circle swing. Positive, finger-tip control. Turntable mechanism stabilized by ball-bearing top and hook rollers. — **Michigan Power Shovel Co., Benton Harbor, Mich.**

EXPLOSION-TYPE TAMPER utilizing principle of "Delmag Frog" and weighing 220 lb. may be used as an earth or fresh concrete tamper, as a concrete and pavement breaker and as a pile-driver. In operation explosion of aviation gasoline or benzol throws machine up about 16 in., impact of free fall striking terrific blow. Ignition by push button located on handle. Strikes 60 to 80 blows per minute. Direction and length of hop governed by inclining tamper. One-man operated. Fuel, 3 qt. in 8 hr. Interchangeable bases provided for various duties. Superior compaction, ease of operation and economy are advantages claimed for machine — **The Calhoun Co., 1151 S. Broadway, Los Angeles, Calif.**

EARTH DRILL, trailer-, tractor- or truck-mounted **(right and below),** is used for drilling holes for pole lines, fence posts, guard rail fencing, foundations for buildings, soil testing and exploration work. Powered by twin-cylinder opposed, air-cooled, heavy-duty engine. All parts of dust-proof drill head assembled in one unit. Clutches carried on spline shafts and operated by ball-bearing throwouts. Ball-bearing drive shafts. Square, alloy-steel drill spindle. Self-cleaning roller chains for lifting dirt from hole are located on each side of spindle and equalized to carry proper share of load. Fully inclosed gears. Easy-to-operate controls. May be had in sizes up to 24 in. in diameter for depths up to 10 ft. Blast hole drills 1¾ in. in diameter also are available. Photo shows electric-drive machine. — **The Buda Company, Harvey, Ill.**





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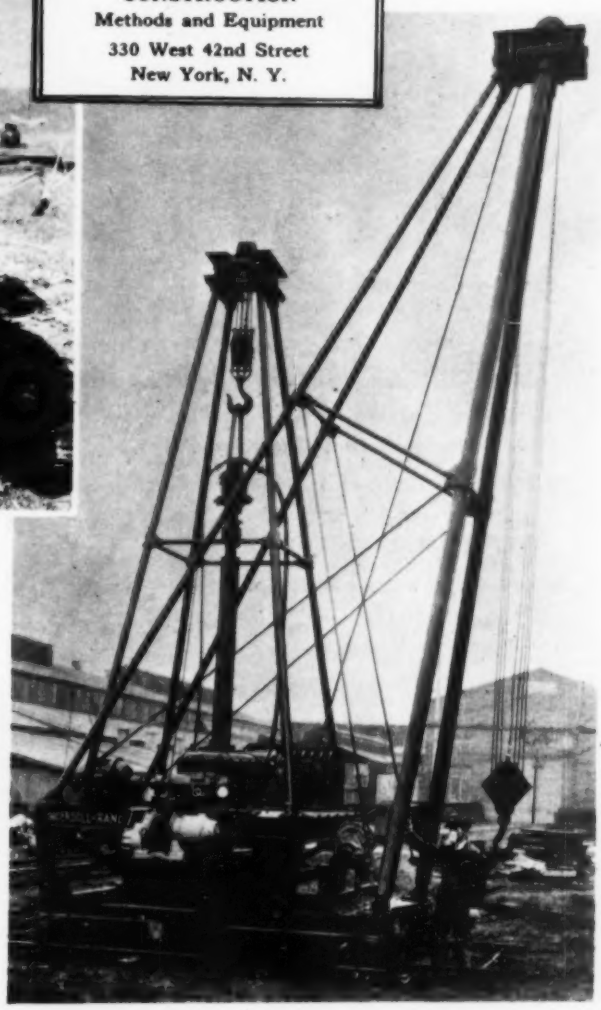
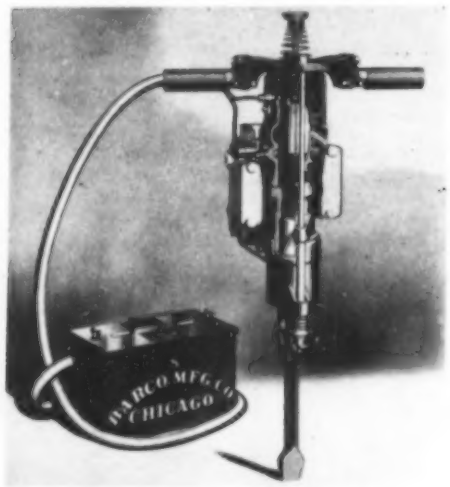


4-YD. WAGON SCRAPER (left and above), known as "Junior Continental," designed for use with crawler tractors from 35 to 50 hp. has been kept light in weight without sacrifice of ruggedness necessary to dig, load and haul capacity loads of tough clay, rock, tree-root imbedded soil, shale or hardpan. Other features: high axle clearance; large, fast-dumping rear gate; hydraulic power-control unit with adaptors for all tractors of 35 to 50 hp.; shorter overall length for easier turning and wide cutting blade equal to that on 5-yd. size. — **Continental Roll & Steel Foundry Co., Tractor Equipment Div., East Chicago, Ind.**

SHAFT-CORE DRILL for use in checking natural rock formations and grouted areas in foundation preparation and for drilling large diameter holes for exploration shafts, ventilation and underpinning, outlet shafts on sewer construction, and cutting out stone rollers for grindstones. Drills holes up to 6 ft. in diameter and 100 ft. deep and has cutting speed of from 8 to 10 in. per hour in granite with greater speed in softer formations. Tubular steel tension derrick controls load on drilling bit by electric hoist while tools are driven through spindle rotating device with floating vertical range of 9 ft. When drilling is completed, drill rod is disconnected, entire drill is rolled back from hole and core and tools are removed by 30-ft., 20,000-lb. capacity boom-type derrick. Dewatering boilers and clean-up buckets are handled by smaller, faster hoist operating on same derrick. Complete machine moves easily on tracks, enabling machine to drill and remove cores with minimum loss of time.—**Ingersoll-Rand Co., Phillipsburg, N. J.**

Construction Equipment News *(Continued)*

PORTABLE GASOLINE HAMMERS in two new models, have several improvements in design, among them addition of timing device and rearrangement of bottom end. Tierod springs have been eliminated and an internal cushion spring substituted. When hammer is lifted for new location spring takes shock

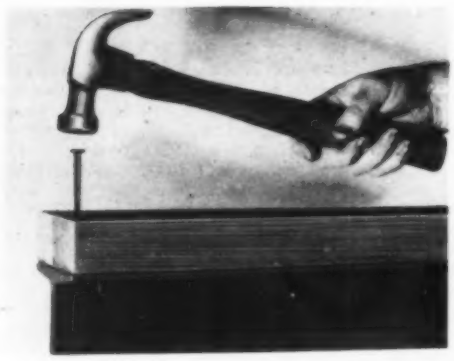


of blow, reducing impact shock to other parts. Changes also give hammer slightly more power and reduce vibration. Quick-acting lock is another new feature. Heavy-duty model (weight, 89 lb.) for pavement and rock breaking, shallow drilling, backfill tamping, asphalt cutting, driving of sheeting and general demolition work. Small machine (weight, 70 lb.) for continuous drilling. For use with smaller model there is available small portable battery for easy transportation to inaccessible locations.—**Barco Manufacturing Co., 1801 Winnemac Ave., Chicago, Ill.**

VERTICAL AIR COMPRESSORS, for use in construction, mining and tunneling operations where air capacities greater than those obtainable from portable units are desired, are available in three sizes: 445, 550 and 720 cu.ft. per minute actual air delivery (displacement, 536, 660 and 856 cu.ft. per

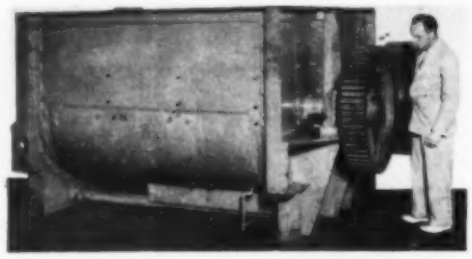
minute). Design: two-cylinder, V-type, two-stage, double-acting. May be moved from job to job by truck or trailer. Each size self-contained, requiring no water service connections for cooling. Direct-connected, V-belt or flat-belt drive powered by diesel or gasoline unit or electric motor. Qualities stressed by maker: Smooth running balance, maximum power economy, precision construction throughout, ability to give reliable service over long period, ease of transportation and small set-up expense.—**Sullivan Machinery Co., Michigan City, Ind.**

HEAVY-DUTY DRIVE-SCREW NAILS drive like nails but turn and hold like screws. Type for attaching wood sleepers or insulation board to sheet steel up to 16-gage without drilling eliminates clamps, bolts, nuts and washers. Made of twisted square



wire in screw gages No. 1 to 9. Heads of any style; lengths ½ to 4 in. All finishes, including noncorrosive. CONCRETE SCREW TYPE for fastening steel or wood to masonry does away with hooks, shields, plugs, expansion bolts and lead anchors otherwise needed. Made in 1- to 4-in. lengths. Other types: (1) floor screw nails in lengths 1 to 2½ in. for attaching flooring to wood sleepers or steel

deck, (2) Nodril concrete pins, in lengths from ½ to 2¾ in. for fastening to concrete or wood cornices, flashings, gutters, spout straps, pipe clamps, eaves, troughs and Masonite Presdwood.—**The Hillwood Mfg. Co., 21700 St. Clair Ave., Cleveland, Ohio.**



DOUBLE-SHAFT ASPHALT PUG MILL MIXER, capacity 7,000 lb. per batch, is equipped with 5½-in. square heat-treated alloy steel shafts, self-aligning anti-friction bearings, heavy cut cast steel gears and cast steel mixer shanks. Mixer tips and shell liners are made of special abrasion resisting cast alloy. All-welded construction. Steam-jacketed, steam-operated. Weight, 19,000 lb.—**Hetherington & Berner, Inc., 701-745 Kentucky Ave., Indianapolis, Ind.**

BLUEPRINT BINDER HANGER to hold as many as 75 blueprints or maps is made of duralumin with center steel hook which may be slipped down in order to permit rolling of prints for transportation or turning back for reference. Three telescoping binder screws with metal strip at back hold prints firmly, preventing loosening, falling or tearing of sheets. Renewable title strip, protected by celluloid, slides in T-slot at top of hanger. Stock sizes 18, 24 and 30 in. Other sizes from 12 to 48 in. made to order.—**Wade Instrument Co., 1663-C East 118th St., Cleveland, Ohio.**

Discussion on Labor Relations

Comment on article by Arthur A. Johnson, President, The Arthur A. Johnson Corp., in June Issue of CONSTRUCTION Methods and Equipment.

By A BUILDING CONTRACTOR
New York, N. Y.

IN PRINCIPLE I am heartily in sympathy with what Mr. Johnson says in regard to chaotic labor conditions. My thought, however, has been that the collective bargaining idea, now being a national law, it would be a very long and tedious, if not impossible task to cover it by a state law and I also feel that, owing to the different questions involved in working conditions in each trade, these conditions would necessarily have to be discussed by an employing representative of the trade as well as labor representative for the special trade, plus, if you please, the addition of the state officer as suggested by Mr. Johnson.

I, therefore, lean to the second suggestion of Mr. Johnson's, that labor organizations be required to assume the same responsibility that the employers assume, that their books be open to inspection and that they conduct labor organizations on the same basis and subject to the same investigations and requirements as any other business. This, while it does not cover the entire point, would require a report of the manner of disbursing receipts from dues, initiations, etc., mentioned by Mr. Johnson, thus bringing to light the moneys received and handled. This, I believe, should be the first step in the control of labor organizations.

Samuel Gompers, while in power, fully realized the danger of labor organizations being placed in the position of being responsible for their acts and he consistently opposed any acts by labor organizations that would lead up to their being put in such a position.

It is perfectly evident that while labor has gone so far politically as to emphasize the necessity of being put under such a responsibility, those handling the labor policy are strenuously objecting to any such move.

I feel, therefore, that the first step should be a concentration on the incorporation of labor organizations and heartily agree with Mr. Johnson that this cannot be "laughed off." Because of the serious consequences of the acts of the labor unions in recent months, this problem has received increasing notice and I believe that a continued agitation and insistence would make it difficult for labor unions or the administrators of the Wagner Act, to maintain the position that they, the labor organizations, can go scott free while there is a law provided for everyone else which, labor is insisting, be fulfilled in every particular."

News from Manufacturers

ABOUT THEIR PRODUCTS

The publications, reviewed below, will keep you posted on latest developments in construction equipment and materials available for your use.

CURING CONCRETE—**Johnson-March Corp.**, 52 Vanderbilt Ave., New York, N. Y. (Two 4-pp. folders, illustrated.) Two materials for spraying on surface of wet concrete to retain water content in mass during setting of cement. Hunt process involves application of thin film of bituminous compound to protect green concrete from evaporation during curing period. Ritecure forms a colorless, transparent membrane that seals moisture in the concrete. Both products applicable to concrete highways, bridges, floors, walks and structures.

• • •

AUTO PATROL GRADERS — **Caterpillar Tractor Co.**, Peoria, Ill. (40 pp., illustrated.) Self-propelled road machines in two sizes (60 hp. and 44 hp.) powered by diesel or gasoline engines and equipped with 12-ft. blades. Tandem or single drives. Operating movements power-controlled. Visibility and comfort for operator. Low pressure pneumatic tires for tandem drive. Provision for snow plow mounting. Notes on special attachments, including tire pump, scarifier, electric starting system, leaning front wheel axle, blade extensions. Tabulation of detailed specifications.

• • •

CURING CONCRETE ROADS—**Philadelphia Quartz Co.**, 121 South Third St., Philadelphia, Pa. (16 pp., illustrated.) Describes use of silicate of soda "Concrete Special" as curing agent for concrete. Coating applied to concrete surface by brushing or spraying dries to colorless, transparent film which checks evaporation of water from body of concrete and leaves clean surface without discoloration or stain. Table gives figures on required quantities and costs of curing various widths of road from 18 to 40 ft.

• • •

HEAVY CONSTRUCTION EQUIPMENT—**Union Iron Works**, Elizabeth, N. J. (26 pp., illustrated.) Covers variety of products including grout mixers and ejectors for tunnel work and dam foundations in 7- and 10-cu.ft. sizes for pressures from 100 to 350 lb. per square inch. For extremely high pressures (up to 5,000 lb. per square inch) for sealing rock crevices or seams the Union-Hulse hydraulic grouting machine is described. The Hackley pneumatic concrete placer, with batch capacities from ½ to 3 cu.yd. is designed for lining tunnels with concrete. Other equipment includes mine-type shaft cages, portable centrifugal pumps, air motors, sheaves, automatic bottom-dump concrete buckets in sizes from ½ to 8 cu.yd., submarine concrete-placing buckets, skips and scale boxes. Several pages deal with air locks (top-door and side-door types) and equipment for subaqueous foundations. Also tunnel shields and caisson buckets and piledriving hammers.

• • •

PUMPS — **Economy Pumping Machinery Co.**, 3431 West 48th Place, Chicago, Ill. (256 pp., illustrated.) Price and data handbook covering pump applications in waterworks, sewage, power, industrial, irrigation and construction fields. First half of book gives pump prices, applications and installation data; second half gives engineering data for designer and operator.

• • •

BELT MAINTENANCE MANUAL—**The B. F. Goodrich Co.** (Mechanical Rubber Goods Division), Akron, Ohio. (2-pp., illustrated.) Care and maintenance of conveyor and elevator rubber belting, illustrated with drawings and job photographs. Topics discussed in Manual include: Saving belt wear at loading points; how reduced speeds save belts; how to make conveyor belts run straight; belt wear controlled by idler spacing; how to install belt conveyors; splicing and repairing; causes of rapid wear and injuries. Tabulated data on conveyor belt sizes, capacities and power requirements. Written in practical, non-technical language for the operating man.

ASPHALT MANUAL — **The Asphalt Institute**, 801 Second Ave., New York, N. Y. (240 pp., illustrated, size 3⅜x5¾ in.) Sixth edition, revised and enlarged, of pocket reference for highway engineers, by Prevost Hubbard, chemical engineer, and Bernard E. Gray, chief highway engineer of The Asphalt Institute. Comprehensive handbook on all phases of asphalt highway construction. Seventeen chapters include facts about asphalt, condensed specifications, tests, paving plants, modern paving equipment, design of asphalt pavements, asphalt surfaces and pavements, non-bituminous bases, maintenance and resurfacing, joint filling and bedding courses, bridge floors, tennis courts, airports, asphalt revetment. Useful tables of specific gravity, weight and volume relations of asphalt and mineral aggregates, quantities for various rates of application, etc.

• • •

BITUMINOUS DISTRIBUTORS—**Austin-Western Road Machinery Co.**, Aurora, Ill. (8 pp., illustrated.) Present models, in sizes from 800- to 1,200-gal. capacity, include following features: Constant motor speed; constant speed pump; fifth wheel tachometer; dripless spray bars; heat control; balanced weight; operators controls. Minimum of exposed piping. Tanks are elliptical for low center of gravity and clearance height.

• • •

HORIZONTAL EARTH DRILLER — **Hydrauger Corp., Ltd.**, San Francisco, Calif. (4 pp., illustrated.) Small air-driven machine drills holes 2½ to 14½ in. in diameter with accuracy for distances exceeding 100 ft. under streets, highways, railroads and structures.

• • •

HARD FACING FOR ABRASIVE WEAR — **Haynes-Stellite Co.**, Kokomo, Ind. (104 pp., illustrated.) Applications of Haynes-Stellite hard-facing products, welded on to wearing parts of equipment to reduce wear and lower repair or replacement costs. How parts formerly sent to scrap pile can be salvaged. Chapter on excavating equipment covers hard-facing of power shovel dipper teeth, dragline buckets, clamshell buckets, ditching machine teeth, dredge cutters, tractor treads, scarifiers, grader blades, concrete mixer blades, etc. Notes on hard-facing procedure by standard fusion welding methods.

• • •

ELECTRIC ARC WELDING — **Hobart Bros. Co.**, Troy, Ohio. (94 pp., illustrated, price 50c.) Arc welding manual and operator's training course gives information on welding arc, welding equipment, weldability of metals, types of joints and welds, strength of welds, speed and cost of welding, using metallic arc, welding with bare and coated electrodes.

• • •

GYRATORY CRUSHER — **Smith Engineering Works**, East Capitol Drive at N. Holton St., Milwaukee, Wis. (16 pp., illustrated.) Description, specifications, dimensions and power requirements of Telsmith Gyrasphere crushers with bottom head diameters of 24, 36 and 48 in. Designed for more effective secondary crushing, to produce more cubical aggregate and fewer oversize slabs and splinters.

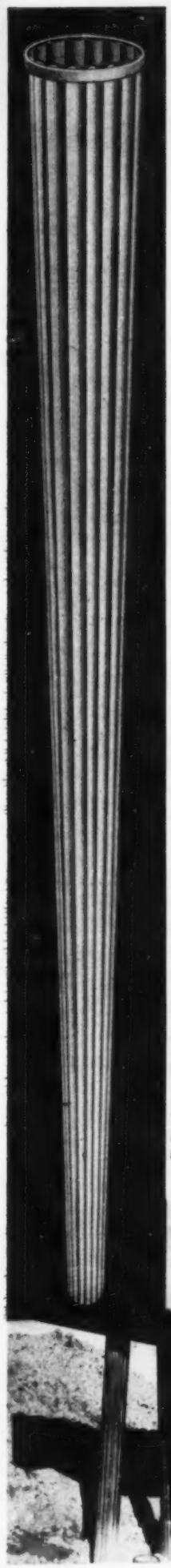
• • •

ROAD-BUILDING EQUIPMENT — **Austin-Western Road Machinery Co.**, Aurora, Ill. (24 pp., illustrated.) Pictorial catalog featuring road-making, earth-handling, rock-crushing and street-cleaning machines in operation, and providing brief specifications and reference data. Covers blade graders, elevating graders, rollers, scrapers, small power shovels and cranes, rippers, wagons, scrapers, crushers, bituminous distributors, snow plows and road drags. Details of mechanical and hydraulic power control.

• • •

TRUCK MIXERS AND AGITATORS — **Blaw-Knox Co.**, Pittsburgh, Pa. (50 pp. illustrated.) Modern design truck mixing and agitating units of all standard sizes and capacities for ready-mixed concrete service. Truck-mixer sizes from 1 to 4 cu.yd. and agitators from 1½ to 6 cu.yd. Specifications and dimensions. Details of drum blades, water measuring tank, front end controls, transmission, subchassis, drum rollers, dual-operating controls and positive seal door. Suggested setups for ready-mixed concrete plants with yearly outputs of 3,000 to 10,000 cu.yd. The company offers complete service in designing and equipping central concrete mixing plants and truck mixer loading plants.

EVERY HAMMER BLOW COUNTS WHEN YOU DRIVE



UNION METAL *fluted steel* PILE SHELLS

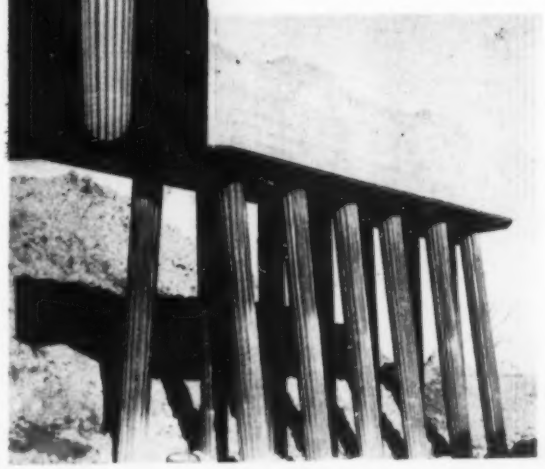
● It takes fewer hammer blows to drive Union Metal Fluted Steel Pile Shells to the desired loading. The great strength and rigidity of these hollow shells, obtained through cold rolling and fluted design, eliminates need for heavy core or mandrel. This means faster driving because with their reduced weight the full force of the hammer is transmitted directly to the driving point.

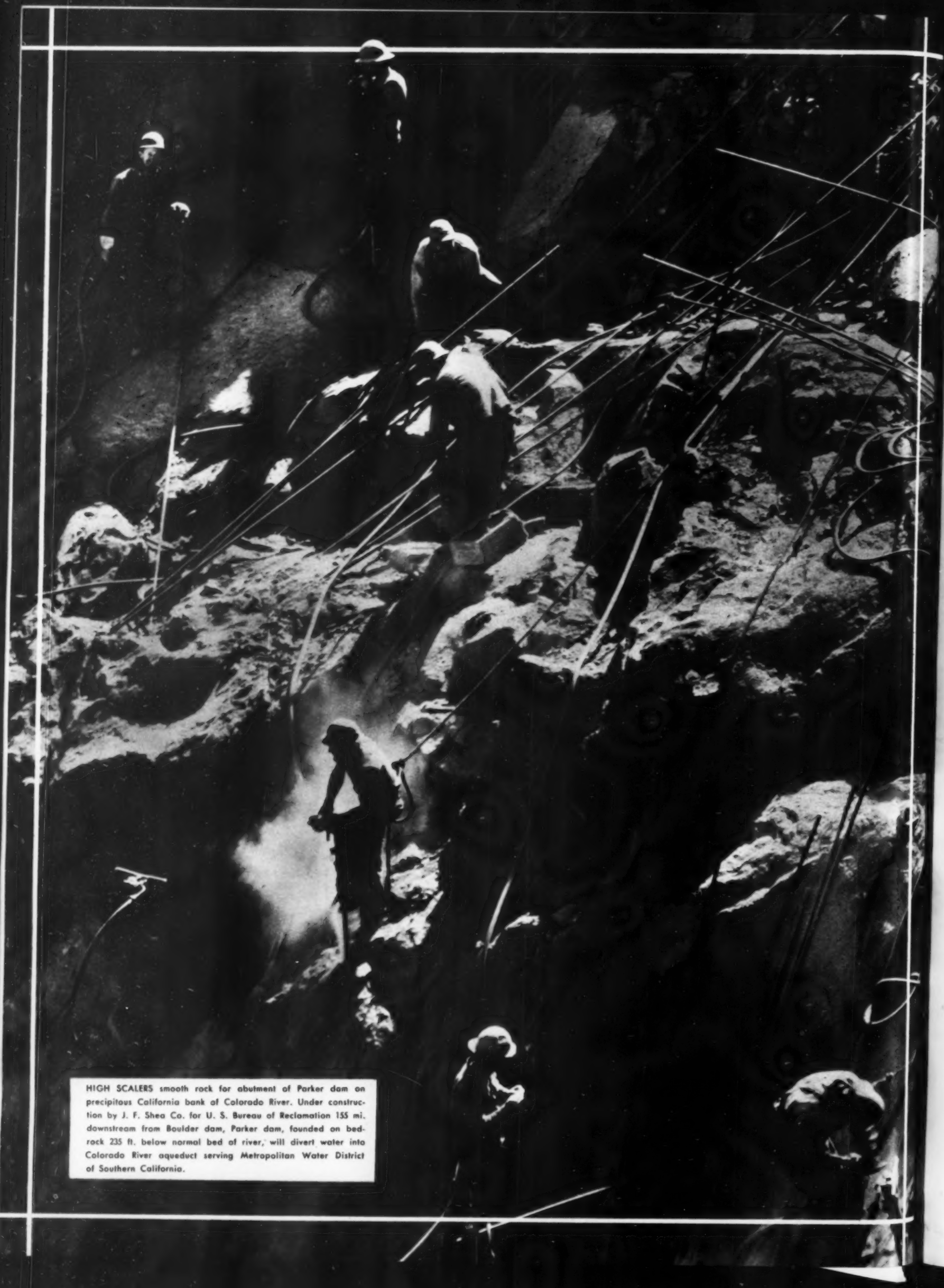
Union Metal shells speed up piling jobs in other ways, too. Their light but sturdy construction makes for easy, fast handling without aid of special rigs and slings; enables them to be driven with ordinary crane equipped with standard leads and light hammer.

You can install dependable cast-in-place concrete piling in less time and for less money when you specify Union Metal Pile Shells. Write for new illustrated catalog.

THE UNION METAL MANUFACTURING CO.
CANTON, OHIO

Trestle bridge abutment built on Union Metal Shells by Muskingum Conservancy District of Ohio. Engineers—U. S. Engineers, Zanesville, Ohio





HIGH SCALERS smooth rock for abutment of Parker dam on precipitous California bank of Colorado River. Under construction by J. F. Shea Co. for U. S. Bureau of Reclamation 155 mi. downstream from Boulder dam, Parker dam, founded on bedrock 235 ft. below normal bed of river, will divert water into Colorado River aqueduct serving Metropolitan Water District of Southern California.

Tested and Approved for HEAVY DUTY

Only when wire comes within the narrow tolerance of our rigid specifications, is it permitted to go into any Broderick & Bascom Wire Rope.

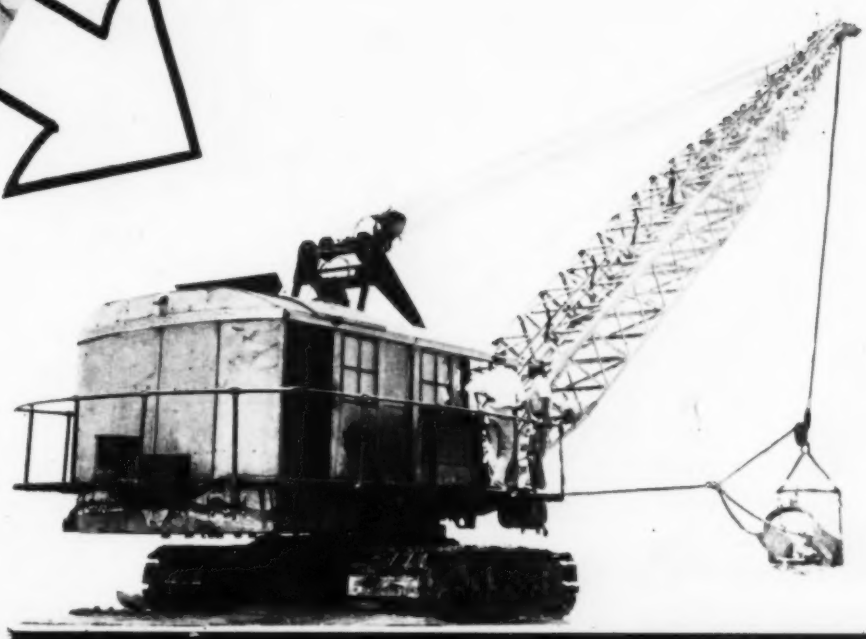
The qualifications for use in Yellow Strand are particularly high because this celebrated rope is intended for duty where conditions are unusually severe.

"Flex-Set" Preformed Yellow Strand is made of this same high quality wire.

The difference is this: each strand is pre-shaped to the helical form it will maintain in the finished rope.

Result: a rope that is virtually pre-broken in, flexible, easy to handle and install, with little tendency to kink or fatigue.

For long, satisfactory, economical service, use "Flex-Set" Preformed Yellow Strand.



"Flex-Set" Preformed YELLOW STRAND

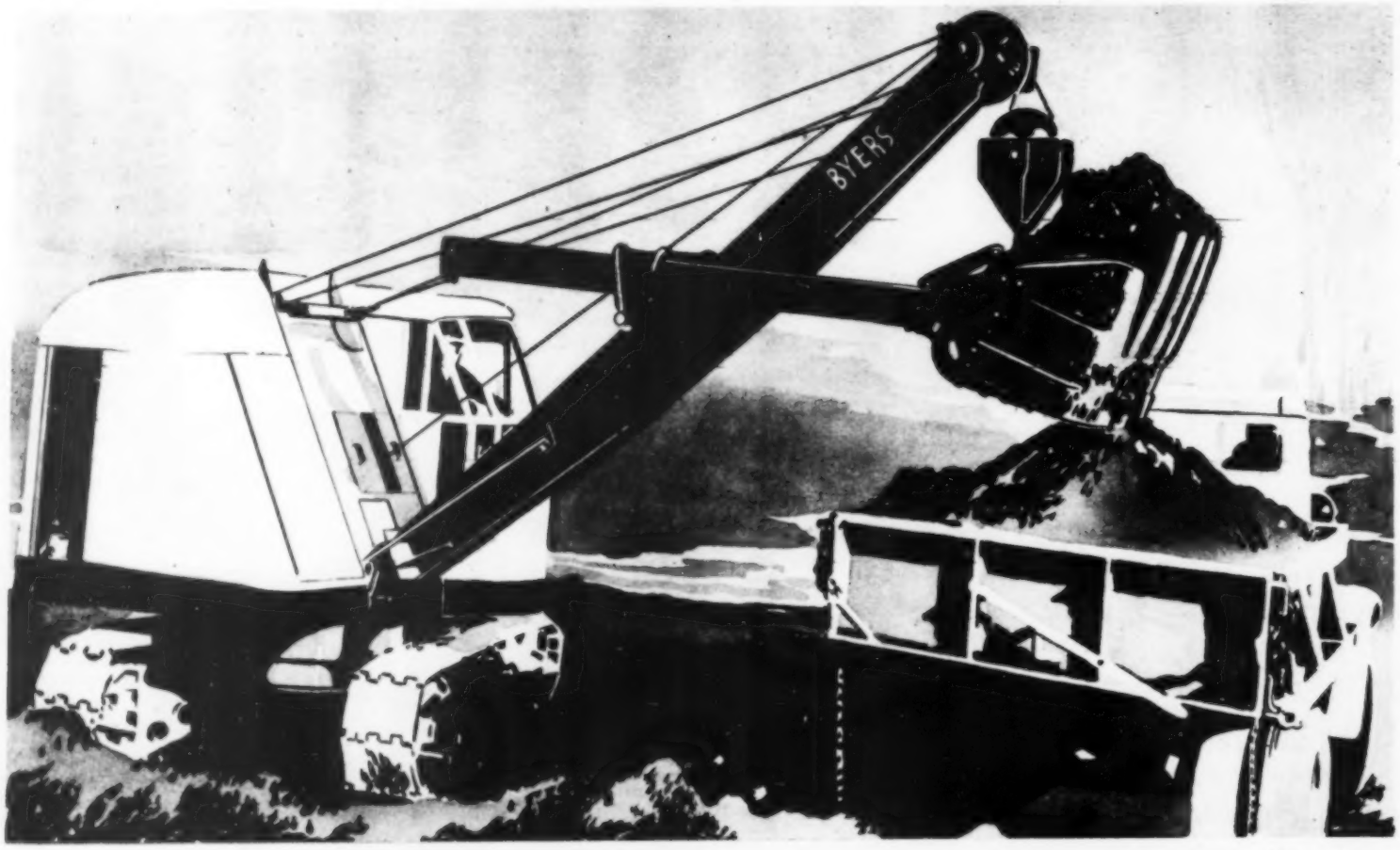
Broderick & Bascom Rope Co.
St. Louis

Factories: St. Louis, Seattle, Peoria

Branches: New York - Chicago - Seattle
Portland - Houston

T-14R2

ECONOMY



Amazes Public Officials and Contractors

"Unbelieveable", that's what they say about Byers Model "62", the shovel that sets new lows on operating costs and breaks yardage records. Timkenized with 26 roller bearings at vital points to eliminate wear, repairs, costly job delays . . with a modern cab . . with direct power drive . . power trip and other economy features, Model "62" digs more yardage at less cost than any other shovel. Challenge us to prove it. We'll show you economies you've never seen in any other shovel. Write today for proof.

BYERS MACHINE COMPANY
RAVENNA, OHIO

BYERS COMPLETE LINE OF SHOVELS AND CRANES

Bear Cat Jr. (¾ swing)	⅜ Yd.
Model 55	⅜ Yd.
Model 62 (shown above)	½ Yd.
Model 66	⅝ Yd.
Model 80	¾ Yd.
Model 100	1 Yd.
Model 125	1¼ Yd.

BYERS MODEL "62"

"YEAR AHEAD" ECONOMY, PERFORMANCE AND DESIGN

THE TRUCK GMC OF VALUE

GMC builds *"from the smallest to the largest"* in trucks, knowing full well that in no other way can the widely changing needs of excavators and builders be served. The purchase of a GMC does not limit the buyer merely to a choice of *size*. The GMC line offers selection of all *conventional* types, the popular new *cab-over-engine* models,—or the new two-wheel *Trail-abouts*,—also full-size *trailers!* . . . all at *prices now crowding the lowest!*

Time payments through our own Y. M. A. C. Plan at lowest available rates

GENERAL MOTORS TRUCKS & TRAILERS

GENERAL MOTORS TRUCK & COACH • DIVISION OF YELLOW TRUCK & COACH MANUFACTURING COMPANY • PONTIAC, MICHIGAN

88 BRIDGES
INCLUDED IN FLOOD TOLL

This new concrete bridge replaces one of 88 bridges destroyed or damaged in Division No. 9 of the New Hampshire State Highway Department by last year's disastrous floods.

Using calcium chloride admixture in the concrete, the highway department replaced or repaired these 88 bridges during the period from October, 1936 to spring of this year—right through the winter. The high early strength accomplished by calcium chloride admixture made this winter bridge construction possible, as it makes *all* cold weather concreting possible.

High early strength, decreasing the time necessary for protecting the concrete, is not the only advantage gained by the use of calcium chloride. Exhaustive tests by the National Bureau of Standards reveal, to quote from the report itself:

> **"*Calcium Chloride not only greatly increases the early strength, but also appreciably increases the three year strength of the concrete. All concretes with Calcium Chloride have greater strength than plain concrete, at all ages.*"**

Any concrete construction where speed, strength and finish are factors can be done faster, with better results and at lower cost, when calcium chloride is added to the concrete. Its use is doubly important during the coming cold weather months, if schedules are to be maintained without sacrifice of strength, quality and finish.

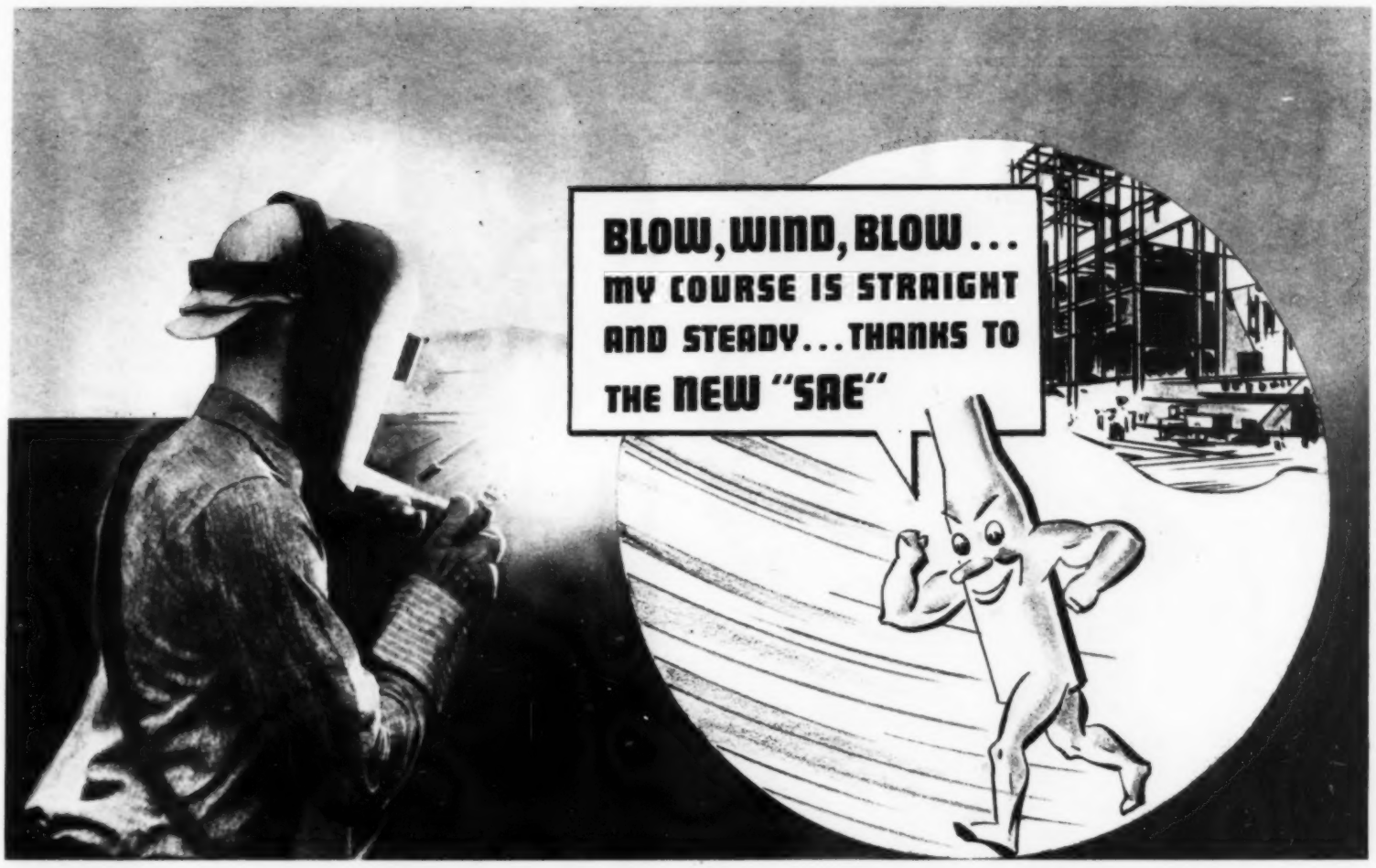
CALCIUM CHLORIDE MAKES COLD WEATHER CONCRETING EASY

Latest information on methods and specifications of calcium chloride admixture in concrete is available from any Association member. Write for it today and find out how cold weather concrete can be made safe and economical.

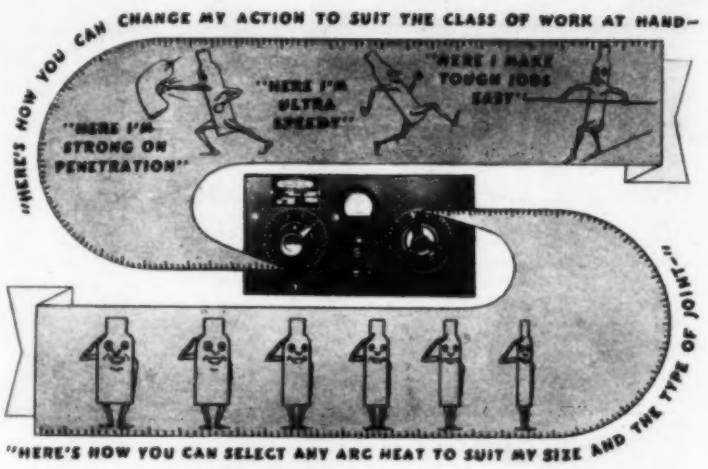
CALCIUM CHLORIDE ASSOCIATION

The Columbia Alkali Corporation - - - - - Barberton, Ohio
The Dow Chemical Company - - - - - Midland, Michigan
Michigan Alkali Company - - - - 60 E. 42nd St., New York City
Solvay Sales Corporation - - - - 40 Rector St., New York City

CALCIUM CHLORIDE
YEAR 'ROUND CONCRETE CONSTRUCTION



"I FIND CONSTRUCTION WELDING 5 TO 10 FEET PER HOUR FASTER WITH THE NEW *'SHIELD-ARC SAE'*


"HERE'S HOW YOU CAN CHANGE MY ACTION TO SUIT THE CLASS OF WORK AT HAND—
"HERE I'M STRONG ON PENETRATION"
"HERE I'M ULTRA SPEEDY"
"HERE I MAKE TOUGH JOBS EASY"
"HERE'S HOW YOU CAN SELECT ANY ARC HEAT TO SUIT MY SIZE AND THE TYPE OF JOINT—"

"During my life, I've worked in some husky gales—out in the wide open spaces and up on the tall tanks and structures that sway in the breeze. Never have I turned out so many dense feet of weld per hour under windy conditions as I do with the new Lincoln Welder. Here's why—

"With its Dual *Continuous* Control you can get an arc with lots of 'knee action'—a type of arc that's designed specifically for work in the wind. You can crowd it—or stretch it—it keeps going.

"With this new welder, you can get *any* TYPE of arc and *any* welding current to suit *every* job. This makes me a specialist instead of a jack-of-all-trades.

"As a result, I give you 15% to 20% faster welding which, on the average job, means as much as a 10-feet-per-hour bonus. Ask for proof.

"Yours for a wider use of welding and lower welding costs,

"FLEETWELD ROD"

—Spokesman for all progress-minded welding electrodes and emissary of

THE LINCOLN ELECTRIC COMPANY

Largest Manufacturers of Arc Welding Equipment in the World

THE LINCOLN ELECTRIC CO., Dept. C-420, Cleveland, Ohio

My welding application is_____

How can the "SAE" do it faster?

☐ Send a free copy of Bul. 412 giving details about the new *"Shield-Arc SAE"* welder.

Name _____ Position _____

Company _____

Address _____

City _____ State _____

LINCOLN "SHIELD-ARC SAE"

THE WELDER WITH DUAL *CONTINUOUS* CONTROL

JUST ONE

of

MORE THAN 5 WRENCH PATTERNS 1000 SIZES

Williams' Structural Wrench

by

ANOTHER PATTERN POPULAR WITH CONSTRUCTION MEN . .

Deep opening at 15° angle. Long, easily-gripped handle with tapered end. Openings: 7/16 to 2".

Williams Construction Wrench

J. H. WILLIAMS & CO.
78 Spring St., New York

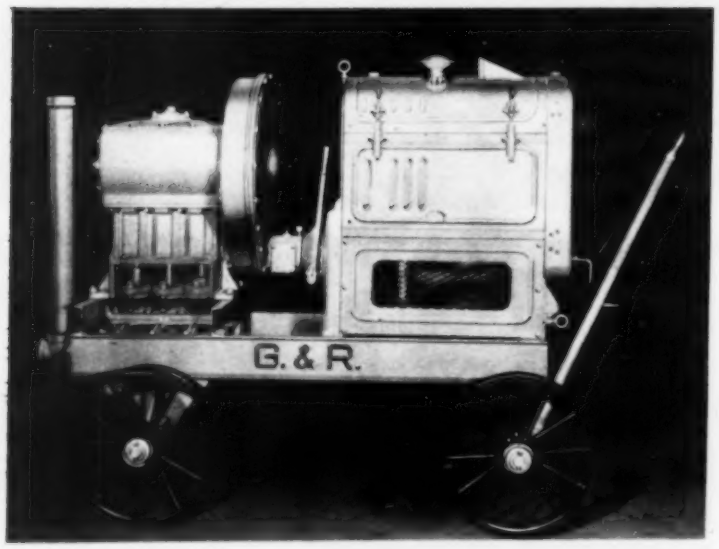
Headquarters for: Drop-Forged Wrenches (Carbon and Alloy), Detachable Socket Wrenches, "C" Clamps, Lathe Dogs, Tool Holders, Eye Bolts, Hoist Hooks, Thumb Nuts and Screws, Chain Pipe Tongs, Vises, etc.

WILLIAMS
SUPERIOR DROP-FORGED TOOLS

G & R Triplex Road PUMPS

Modern-Efficient

DESIGNED FOR 1937 CONCRETE ROAD BUILDING



100 GPM AT 600 LBS. PRESSURE
125 GPM AT 500 LBS. PRESSURE

No need to skimp on water when you have a G & R Triplex on the job. High pressure puts water where you need it at a big saving in piping costs. Here is the pump designed for 1937 road building.

NEVER AIR BOUND

Automatic Air Release now eliminates the bother of opening pet cocks by hand to release the air that every road pump picks up with the water. Your G & R Triplex is always delivering its full capacity to the job.

FULLY ENCLOSED — SELF OILING

All working parts of the pump are fully enclosed and deluged with oil. Simply fill the crankcase with oil. No hand oiling of any parts required.

PLUNGERS NOT DAMAGED BY SEDIMENT

Since the water end of the pump is below the pump body, any sediment in the water passes through the pump without having a chance to lodge in the plunger packing — a big advantage, assuring a long plunger life.

BUILT FOR LONG, HARD SERVICE

Liberal use of Molybdenum alloy heat treated steel and oversize bearings, combine with the rugged design of G & R Triplex Pumps to assure long years of trouble free service. Be sure you know what you get in a Road Pump — compare them all with G & R.

Get all the information on G & R Pumps before you buy any pump this year. They are the most dependable pumps at the lowest price for water supply or drainage.

THE GORMAN-RUPP CO., Mansfield, Ohio

Forging another

23-MILE TEXACO LINK

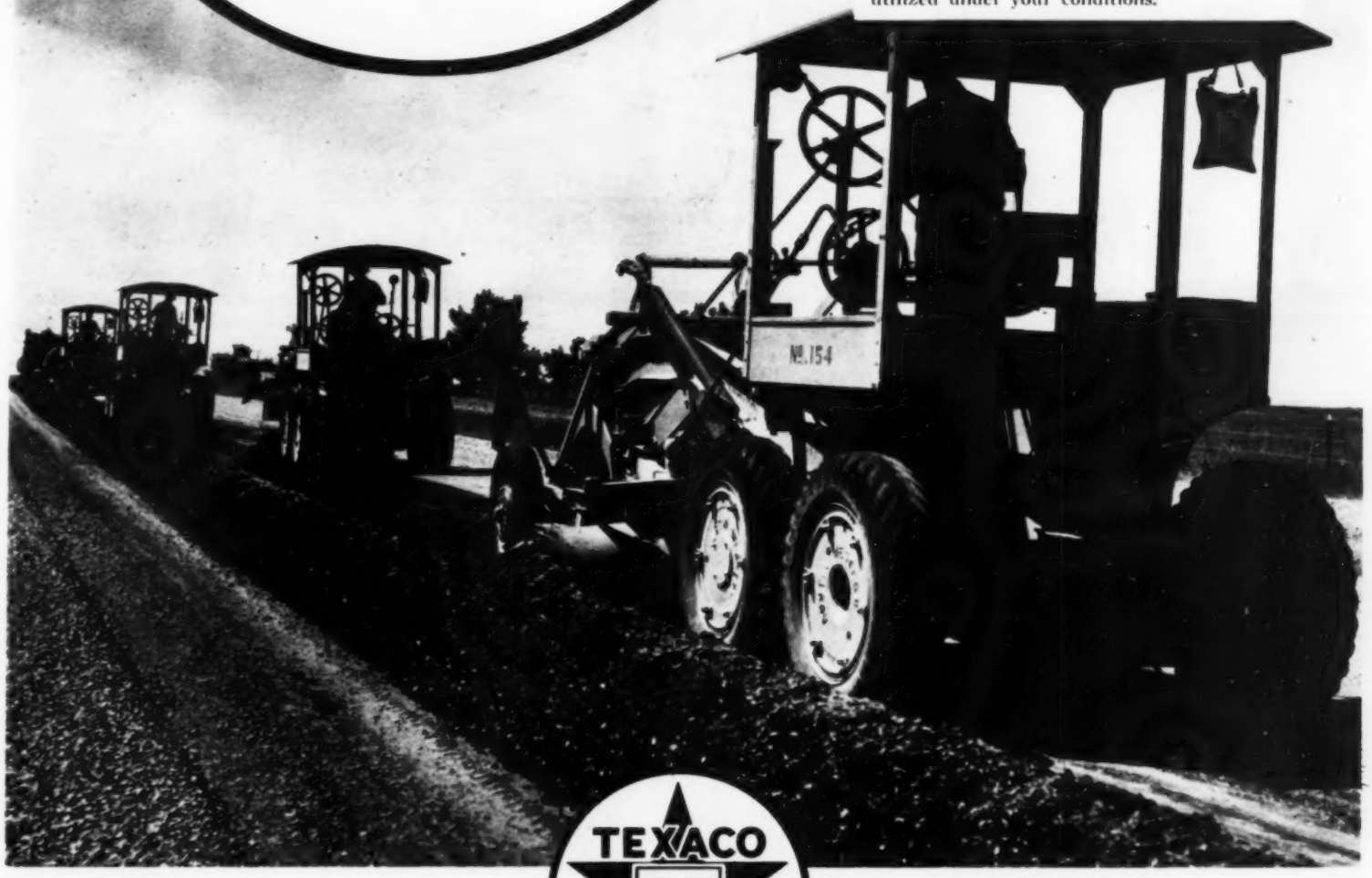
into the

COLORADO STATE HIGHWAY SYSTEM

This battery of blade graders is engaged in mixing TEXACO Asphalt Surfacing Material and mineral aggregate on Colorado State Highway No. 185, north of Denver. Employing this "mass production" method, Colorado was able to complete the 23-mile Asphalt Road-Mix project in excellent time.

Inexpensive to construct and offering a resilient, tough and safe-riding surface, this TEXACO Road-Mix type of highway construction is ideal for a large portion of every State Highway System and also for most of the Secondary Road System.

Have a Texaco Field Man call and explain fully how this type of surface might be utilized under your conditions.



TEXACO

ASPHALT

THE TEXAS COMPANY, Asphalt Sales Department, 135 East 42nd Street, New York City

Chicago Cleveland Kansas City Houston Dallas Buffalo Philadelphia Richmond Boston Jacksonville

REACH OUT FOR EXTRA PROFITS

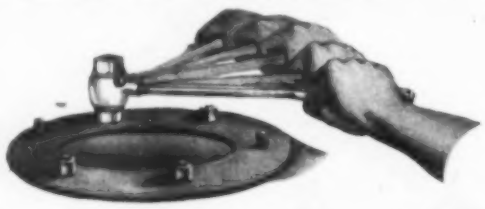
More money can be made by Contractors who use the convertible ⅜-yard MICHIGAN TRUCK SHOVEL-CRANE! Municipal budgets go farther, through savings the MICHIGAN makes.....With ordinary truck economy the MICHIGAN speeds from job to job at 25 miles per hour. FINGERTIP AIR CONTROLS keep both machine and operator at top efficiency from start to finish.....fast operation without fatigue!

Write for Bulletin C.M.

MICHIGAN POWER SHOVEL CO.
BENTON HARBOR, MICHIGAN

SPEED UP NUT TURNING WITH THE FAVORITE REVERSIBLE RATCHET WRENCH

The "FAVORITE" is a safety wrench — it does not leave the nut until it is seated or removed. Slipping, and damage to the nut as well as to the knuckles, is done away with. The ordinary open-end wrench has to be lifted from the nut at every quarter turn.



The "FAVORITE" is a time-saver, with its straight-ahead ratchet motion. By throwing pawl, reverse action is instantaneous.

The "FAVORITE" turns two different-sized nuts in each head — one on each end. A distinct saving in number of parts to hold in stock.

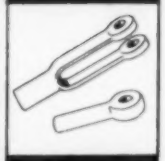
Opening clear through head for free passage of bolt.

SEND FOR DESCRIPTIVE FOLDER

GREENE, TWEED & CO.
SOLE MANUFACTURERS
109 DUANE STREET NEW YORK, N. Y.

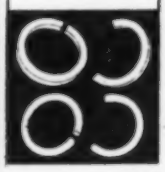
SPRING WASHERS

Spring washers and lock washers of every type and size, including the well-known Hipower and Kantlink types. There are thousands of more places where spring washers would improve the value of any product where bolts, nuts, cap or machine screws are used.



STEEL ROD ENDS

Drop forgings including steel rod ends of the adjustable yoke, plain yoke, and eye types. These articles in standard sizes and threads afford tremendous savings over special designs.

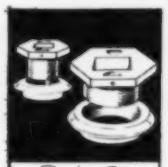


RETAINING RINGS

Spring retaining rings of special heat-treated spring steel are carried in many stock sizes—both open and closed types. Use of a spring retaining ring is an excellent manner of creating a shoulder on a shaft.

STEEL BARREL CLOSURES

Forged and machined fittings for steel barrels, drums, tanks and metal packages, including plugs, rings and flanges. Very rugged for use in transportation of alcohol, turpentine, oils and other expensive liquids.



CONTAINER HANDLES

Forged steel handles for heavy containers—can be rigidly welded, riveted or attached by a strap to lie flat when not in use. Rugged and most satisfactory for hard usage.

RHEOSTATS—RESISTORS—LOAD BOXES AND SPECIAL APPARATUS

Our electrical division—Hardwick, Hindle, Inc.—makes as fine electrical resistance products, fixed and variable, as can be devised.

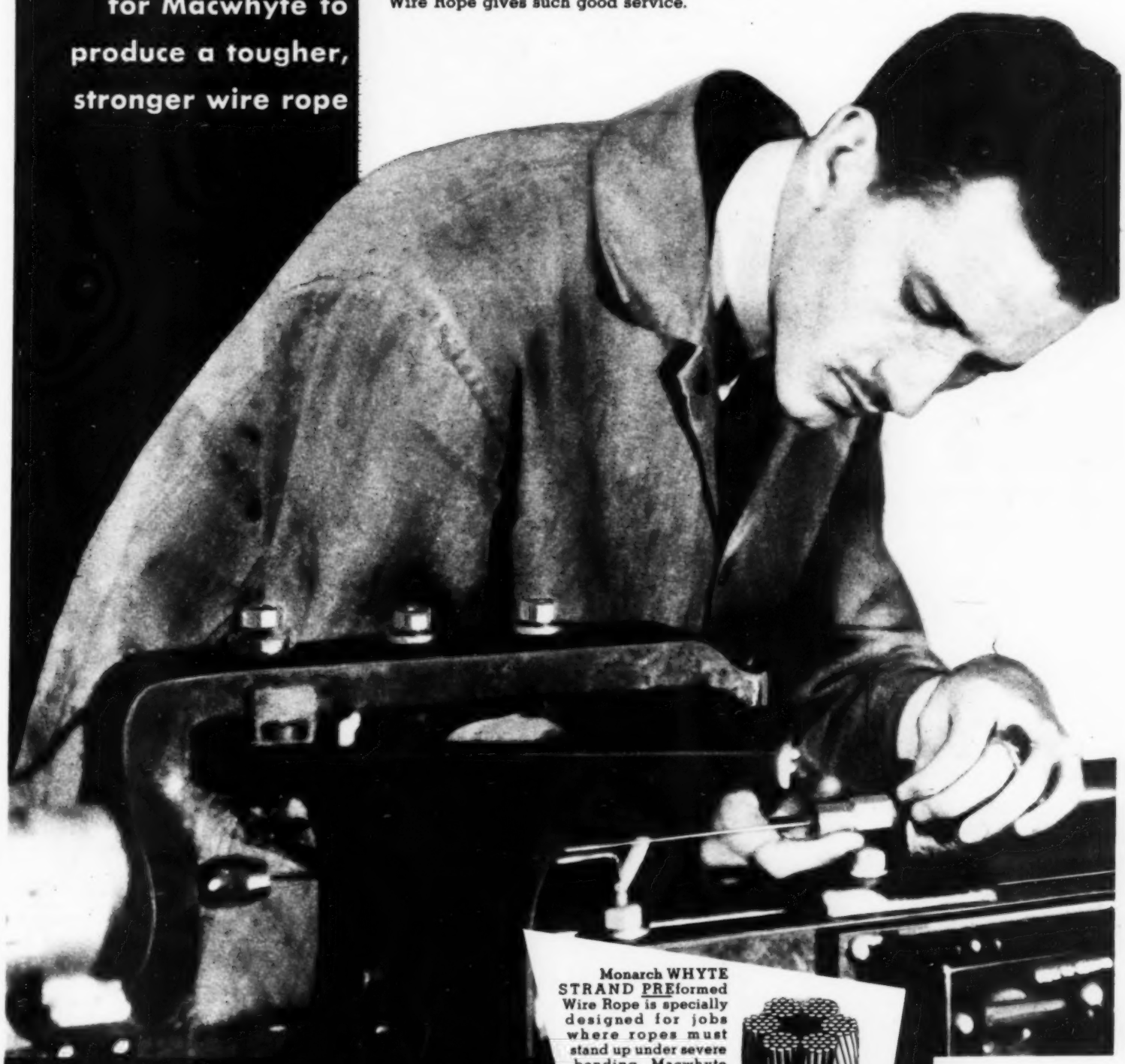
Other products include windows for buses and railway cars, railway car window curtains, curtain rollers and fixtures, sash locks and lifts.

THE NATIONAL LOCK WASHER COMPANY
NEWARK, N.J.—EXPORT DIV., 15 E. 26 St., N.Y.C.

This— Fatigue machine

has made it possible for Macwhyte to produce a tougher, stronger wire rope

● There are only a few of these machines in America. With this Haigh Robertson Fatigue Testing Machine, Macwhyte can measure quickly the resistance which the wire offers to repeated bending stresses. Constant experiments with this machine have helped Macwhyte to develop wire with a higher fatigue resistance. This operation is typical of Macwhyte's policy of producing only high quality wire. Constant research is one of the many reasons why Macwhyte PREformed Wire Rope gives such good service.



MACWHYTE *PREformed* WIRE ROPE

...INTERNALLY LUBRICATED

Monarch WHYTE STRAND PREformed Wire Rope is specially designed for jobs where ropes must stand up under severe bending. Macwhyte manufactures special constructions for shovels, draglines, cableway excavators, scrapers, loaders, mixers, pavers, incline hoists. Macwhyte also makes specially designed non-preformed ropes.

MACWHYTE COMPANY, Kenosha, Wisconsin

Manufacturers of wire rope and braided wire rope slings

Distributors and stock throughout the U. S. A. for quick service

Cordeau is insensitive

● When Cordeau-Bickford Detonating Fuse eliminated the detonating cap from the bore hole, another old-time hazard went by the board. Large-scale loading operations extending over long periods may now be carried on with comparative security, because the detonation of each load is accomplished by a length of this insensitive fuse in direct contact with every cartridge. Only when the job is ready for firing is a blasting cap attached to the main line of Cordeau.

Correct use of Cordeau reduces to a minimum the risk of burned holes or danger from unexploded caps and powder after firing. Cordeau safeguards your investment of time and money — and it cuts down the hazards of blasting operations.

The ENSIGN-BICKFORD COMPANY
SIMSBURY . . . . CONNECTICUT

LESS HAZARD

CORDEAU-BICKFORD
Detonating Fuse

CB64

Bigger Digging PROFIT

...WITH THE WILLIAMS "CHAMPION"

Shorter cable overhaul makes it faster acting.

Exclusive power-arm design gives tremendous digging power.

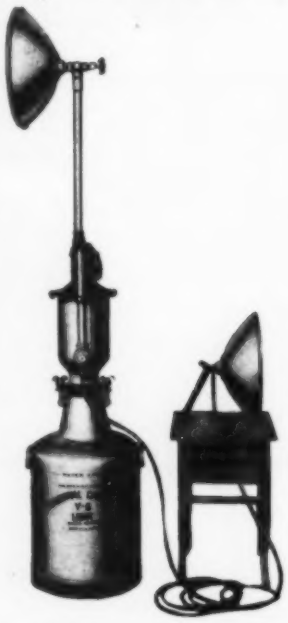
Use it once and you'll use it *always*. Write for bulletin.

THE WELLMAN ENGINEERING CO.
7017 Central Avenue, Cleveland, Ohio
Distributors in Principal Cities

WILLIAMS POWER-ARM, POWER-WHEEL MULTIPLE-ROPE, DRAGLINE
Buckets

NATIONAL CARBIDE

V-G LIGHTS



National Carbide V.G. Light. 8,000 Candle Power without extension; 16,000 Candle Power using extension. Easily handled by one man.

MORE LIGHT FOR LESS MONEY

Easily Handled
No Wires
No Carbide Wasted
No harm done if tipped over

Y 100 National Carbide V. G Handy Light 1500 Candle Power Weighs only 37 pounds charged.

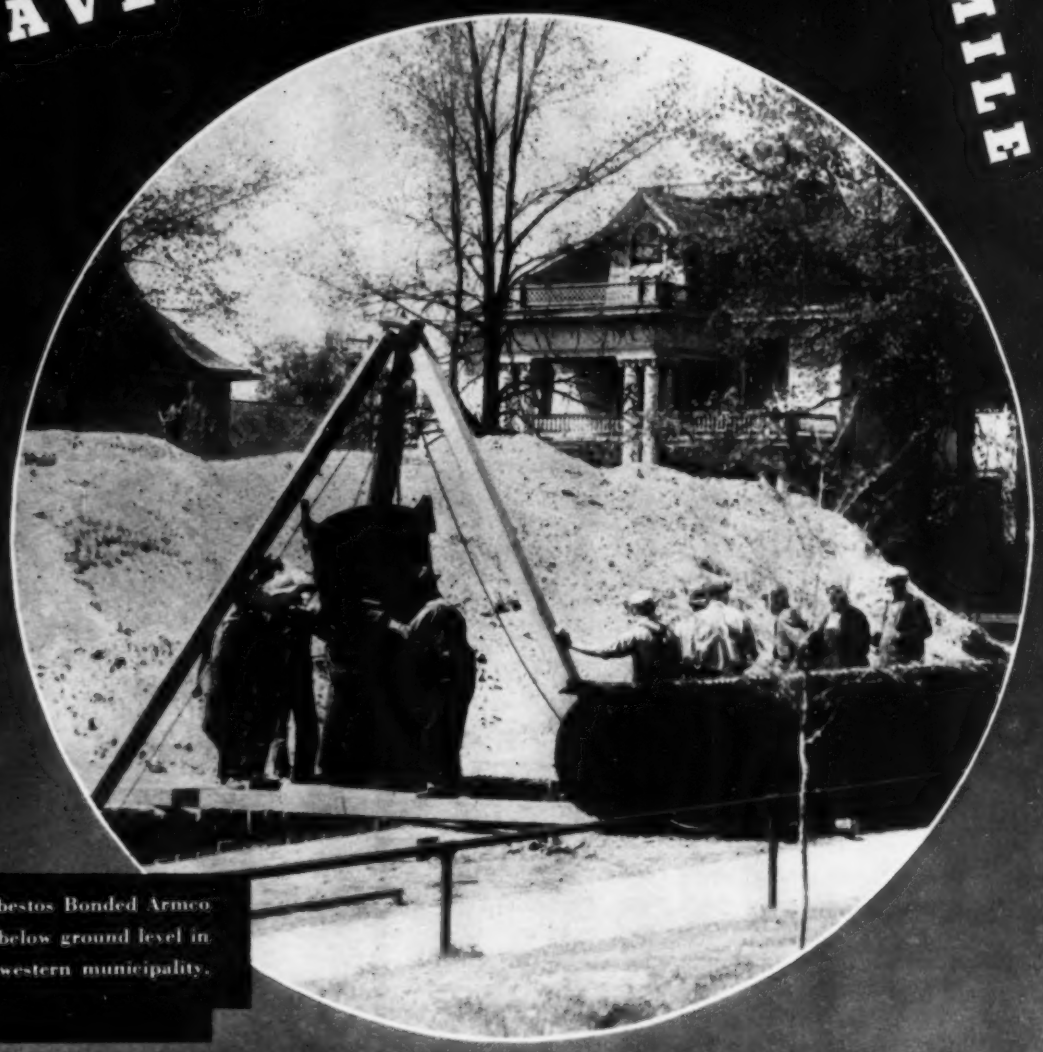
Write for COMPLETE INFORMATION

WII-CI National Carbide Lantern. Brilliant rear signal of red blue or green. Ideal for emergencies

Use National Carbide in the Red Drum

NATIONAL CARBIDE CORP.
LINCOLN BUILDING NEW YORK

YOU SAVE 1056 JOINTS PER MILE



● Installing an Asbestos Bonded Armco sewer line 28 feet below ground level in a progressive mid-western municipality.

NO WONDER contractors are happy when engineers specify *Asbestos Bonded* Armco pipe for permanent drainage and sewer lines. Think of the generous savings in installation costs!

Compare, for example, *264 joints* in a mile of Armco pipe (20-foot lengths) with the *1320 joints* ordinarily required when short sectional pipe is used. And remember, each short section is an individual installation job. It not only must be unloaded and handled, but it must also be "bedded", joined, and well tamped.

That's why it costs *only one-fourth to one-tenth as much* to lay, line and join Armco pipe—to say nothing of the saving in breakage due to handling. With Armco pipe the joints are far apart, easy to make, and foolproof, as only tightly-connected joints can be. Vote for these features and you vote for pipe jobs that turn out satisfactorily for everyone concerned. Armco Culvert Mfrs. Association, Curtis Street, Middletown, Ohio.

ARMCO

ASBESTOS BONDED

ARMCO PAVED INVERT PIPE

Whatever your wall-form problem

RICHMOND TYSCRUS

WILL SOLVE IT!

RICHMOND TYSCRU FOR GENERAL APPLICATION. Most economical where it is not necessary to keep the ends of the tie back from the face of the wall. Used on ordinary building foundation work everywhere. The ½ inch diameter tie acts as a spreader for walls up to 36 inches thick; the ¾ inch diameter tie for walls up to 8 feet thick.

RICHMOND TYSCRU FOR CURVED, SKEWED AND BATTERED WALLS . . . where the use of a spreader is most economical and efficient.

Especially recommended where the wall thickness is such that men are inside the forms while the concrete is being poured, and remove spreaders as the concrete rises. By this method, steel may be kept as much as 3 inches from the wall surface, and the work of pointing is minimized.

RICHMOND TYSCRU FITTED WITH TYCONE FOR KEEPING STEEL BACK FROM EXPOSED WALL FACE. Where only one face of the wall is exposed, and the tie is to be used as a spreader, the steel of the tie can be kept one or two inches back of the wall space by using a Tycone on that end of the tie. Made of malleable iron and unthreaded, the Tycone can easily be removed and be used over and over again.

RICHMOND TYSCRU WITH TYCONES AT BOTH ENDS FOR WATER-TIGHT AND FINISHED MONOLITHIC STRUCTURES. Where the Tyscru is to be used as a spreader, and it is necessary to keep the tie one or two inches back of both wall faces, Tycones are used on both ends of the tie. In pointing up the holes left when the Tycones are removed, the tie sockets make for a secure anchorage of the grout plug.

And . . . working parts are *loaned* to you . . . returnable to us for full credit!

Or — if you have an especially tricky wall problem, Richmond will be glad to help you solve that too. Just drop us a line!

RICHMOND SCREW ANCHOR CO., INC.

Tying Devices for Concrete

241-251 BUSH STREET BROOKLYN, NEW YORK

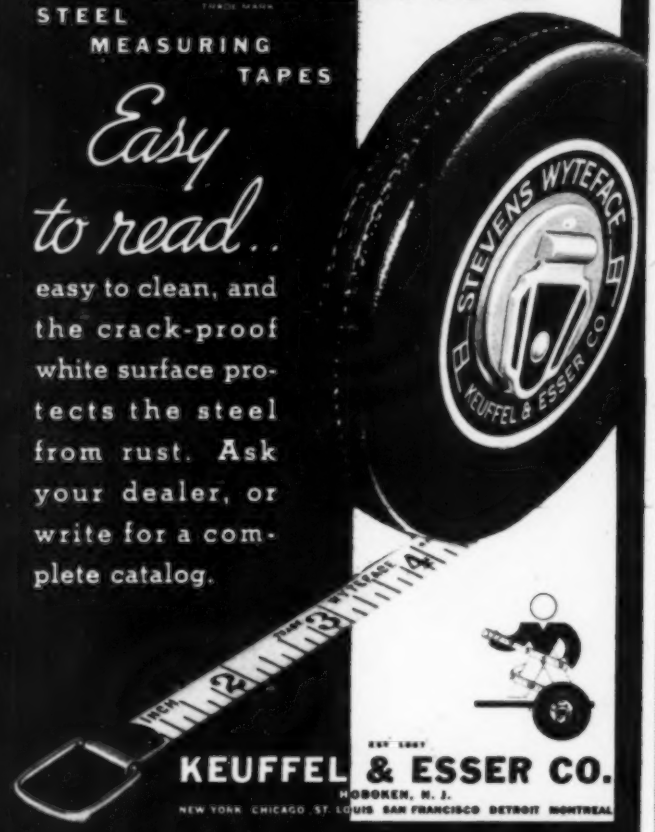
K&E

WYTEFACE

STEEL MEASURING TAPES

Easy to read..

easy to clean, and the crack-proof white surface protects the steel from rust. Ask your dealer, or write for a complete catalog.



KEUFFEL & ESSER CO.

HOBOKEN, N. J.

NEW YORK CHICAGO ST. LOUIS SAN FRANCISCO DETROIT MONTREAL

Placing dry mixes of concrete on deck slabs — Triborough Bridge, New York City

Mall TRADE MARK

CONCRETE VIBRATORS

Dependable Efficient Units for Every Type and Size of Job!

MALL vibrators will pay for themselves many times over with lower labor and material costs, and improved quality concrete.

Bridges, sewage treatment and disposal plants, buildings, piers, abutments, pavements, and culverts are a few of the many construction jobs on which MALL concrete vibrators have saved money for contractors.

Ask your jobber, or write to us direct for complete information and prices.

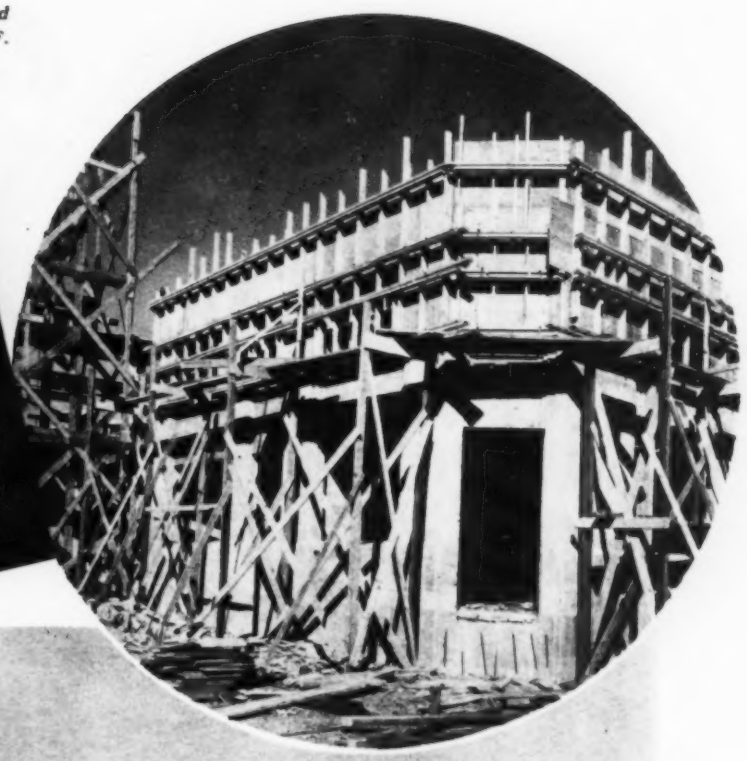
MALL TOOL COMPANY

7757 South Chicago Avenue Chicago, Illinois

OFFICES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

The monolithic concrete office building of the Richmond Sand and Gravel Corporation of Richmond, Va. Edward F. Sinnot, architect; James Fox & Sons, contractor.

THERE'S BIG BUSINESS IN THESE SMALL JOBS *with* Concrete



Obviously important as a source of contract business are the many *big* schools, theaters, offices and factories that are now being built of architectural concrete. Yet there's an equally profitable market in the hundreds of one and two-story commercial buildings, such as this, cast in monolithic concrete with architectural details molded in the forms.

Concrete's firesafety, moderate first cost and low maintenance have established this type of construction.

There's a special construction technique for architectural concrete which results in high quality at low cost. We'll be glad to acquaint you with the latest practice. Write for helpful free literature.

PORTLAND CEMENT ASSOCIATION
Dept. 9-16, 33 W. Grand Ave., Chicago, Ill.

Please send me the manual, *"Forms for Architectural Concrete,"* and also *"Concrete Guide, with Tables of Quantities of Materials."*

Name .....

Position or Company .....

Address .....

Regardless of the load

SUPERIOR BRAKING AND CLUTCH EFFICIENCY..!

EVEN if your excavating equipment is working under maximum capacity . . . you'll find no letdown in the smooth, effective braking performance . . . and more accurate control . . . assured by J-M Friction Materials.

Such service has earned for Johns-Manville its recognized reputation for leadership in the field. And most manufacturers of shovels, draglines, cranes, etc., have come to standardize on J-M Brake and Clutch Materials to safeguard the tremendous investment their machinery represents . . . further indication of the outstanding dependability of these J-M products.

Get complete information on J-M Friction Materials for industry by writing for our brochure, "Johns-Manville Industrial Friction Materials." It includes a detailed recommendation chart that indicates the most efficient material for all types of brake and clutch service. Johns-Manville, 22 East 40th Street, N. Y. C.

JM JOHNS-MANVILLE
INDUSTRIAL FRICTION MATERIALS

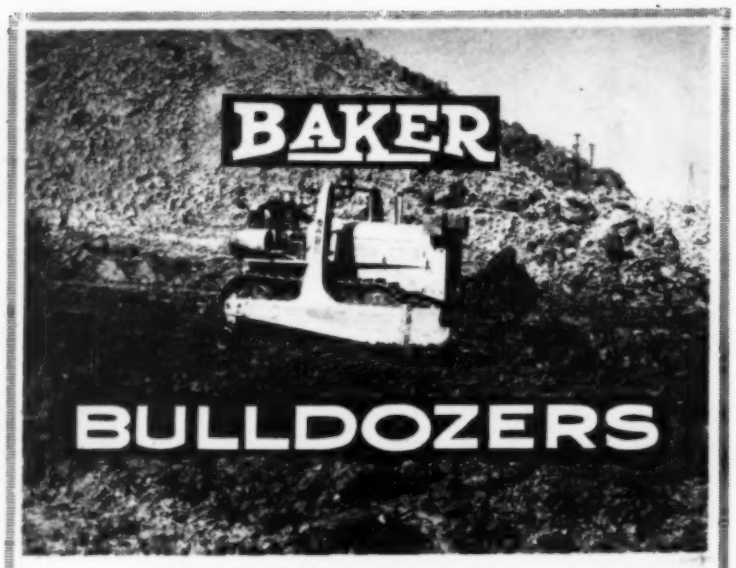
The QUICK-WAY *for handling* ODD JOBS

Shovel work today . . . Dragline, Crane, Clamshell, Orangepeel, Trench Hoe or Pile Driver tomorrow; on jobs miles apart!

ORDINARILY, the cost of moving equipment 50 to 100 miles for a few hours' work is prohibitive—but not with a Quick-Way! Here is the answer to the Construction Industry's need for a light weight power shovel that can be changed over quickly, that can be moved-in and operated fast and inexpensively, and that will stand the gaff of heavy duty work.

The Quick-Way Truck Shovel Co.
DENVER, COLORADO

Quick-Way there — Quick-Way to do the job — Quick-Way to the next one!



The ability to handle each job as it comes up with comparative ease has made Baker Bulldozers and Gradebuilders the top selection of leading construction companies.

This simply-constructed Bulldozer with direct blade lift requiring no cranks, wheels, springs or levers and abounding in real money-saving features, will get you through the tough spots.

Ask for Baker Bulldozer Bulletins

OTHER BAKER PRODUCTS:
ROAD ROOTERS, ROAD DISCS, MAINTAINERS, HYDRAULIC SCRAPERS, SNOW PLOWS

THE BAKER MANUFACTURING CO.
568 Stanford Ave., Springfield, Illinois

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YOUR NEAREST DISTRIBUTOR

Regardless of your needs or location, Galion Distributors. . . choosing from a complete line of proven road building and maintenance equipment . . . know how to provide for reliability under tough conditions, are skilled in the application of road machinery to the job, and will help you select the right unit to give you the least possible trouble in operation and maintenance. ¶ Cost records in counties and states throughout the country give convincing testimony to the money-saving character of Galion graders, rollers, maintainers, scrapers, drags, rooters, sanders and spreaders. ¶ There is an authorized Galion distributor near you . . . to better serve your road equipment needs. Put him on the spot . . . ask him to prove why Galion road machinery is the best to be had.

Diesel motor graders
Gasoline motor graders
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Sanders
Scrapers
Drags
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Ronstadt Hdwe. & Mch. Co.
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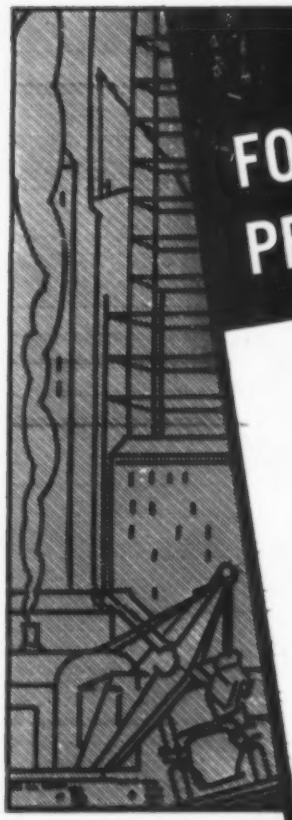

FOR EXTRAORDINARY PERFORMANCE ON ANY CONSTRUCTION JOB

You will find it especially advantageous to equip your men with genuine Duff-Norton Jacks incorporating many exclusive features of design and construction made possible by over 50 years of specialization in quality jack manufacture.

Whether it's a job of lifting, lowering, pushing, pulling or bracing, you will find in the Duff-Norton line an efficient type of jack designed especially for the purpose—famous for performance all over the construction world.

Your Mill Supply Dealer will be glad to serve you.

THE DUFF-NORTON MANUFACTURING CO.
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Duff-Norton Genuine Barrett Automatic Lowering Jack.

Duff-Norton Special 4-Way Chain Jack No. 1523.

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"THE HOUSE THAT JACKS BUILT"

Duff-Norton Jacks

The Blaw-Knox (Ateco) BOTTOMLESS SCRAPER enables the contractor to operate his dirt moving job on a definite schedule and at a profit. It keeps dirt moving costs down.

Tamp as you roll with a Blaw-Knox (Ateco) TAMPING ROLLER, a remarkably efficient and economical device for compacting heavy and light earth fills of every description. Meets requirements of all State and Government specifications.

Send for descriptive catalogs

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Please send:—CATALOG No. 1540—Blaw-Knox (Ateco) BOTTOMLESS SCRAPERS ☐

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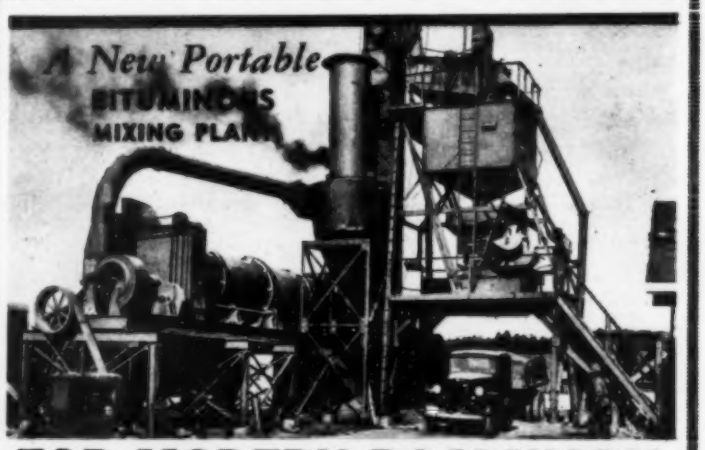


FOR MODERN ROADWORK

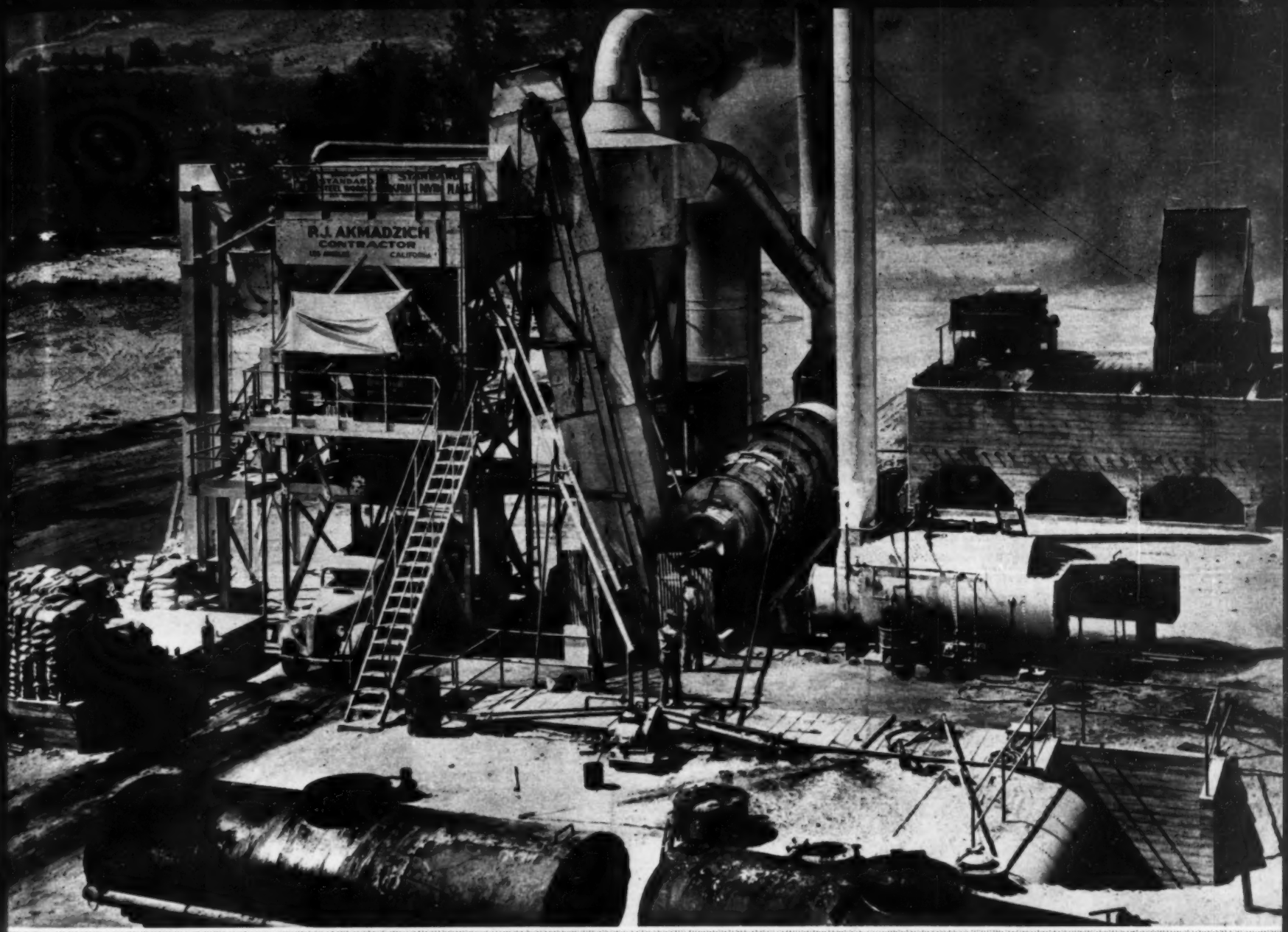
. . . at Low Cost

This plant was designed to meet the demand for the economical improvement of secondary roads. We have built several to date and they have proved their worth in actual service. No investment is needed for a running gear, plant adapted to standard flat bed truck and trailer hauling.

Some Details

- Can be erected by 3 or 4 men in a few days.
- No erection equipment required. Plant equipped with hoist and jib crane.
- Built in 2 units (dryer unit; and screening and mixing unit).
- Comply with most highway loading and clearance regulations.
- SKF bearings throughout. Fully enclosed vibrating screen. Steam-jacketed, steam-operated steel mixer. Large combustion chamber and dust collector.
- Write for Bulletin T-250.

HETHERINGTON & BERNER, INC.
701-745 Kentucky Avenue Indianapolis, Ind.



Standard Paving Plant Sets Record!

This is the new 4000-lb. stationary STANDARD STEEL asphalt plant of P. J. Akmadzich, Los Angeles contractor. Producing strict city, county and state highway specification mixes this plant operates with 5 aggregate compartment bins and 5 separations in screens in addition to rock dust. Operations are completely synchronized from feeder gates to fast discharge gate with 24" x 36" opening.

STANDARD Asphalt Paving Plants are built in a range of sizes from small unit-type models through completely portable styles to large, high-volume stationary set-ups. Call a STANDARD technical man for costs and production figures.

STANDARD STEEL WORKS

GENERAL OFFICES: 5001 BOYLE AVE., LOS ANGELES, CALIF., U.S.A.

BID THE Buckeye WAY
ask for our operation data before you bid

Buckeye DITCHERS with SHIFTABLE BOOMS

Investigate the advantages of

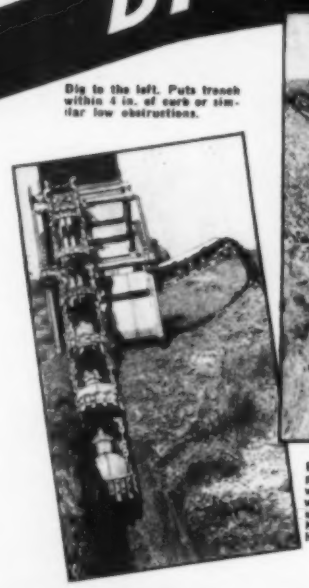
Model 120

Here is a ditcher that digs ditch where you want it — regardless of obstructions along the right-of-way. Gets close to buildings, poles, curbs. Maneuvers neatly in close quarters. Digs trench 16 in. to 30 in. wide and to 11½ ft. deep. Powered for tough going, and makes fast work when the going is easy.

Model 160

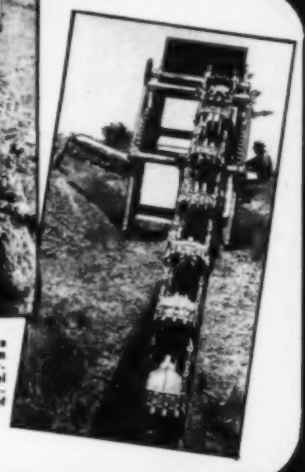
Not many ditching jobs come outside the range of this machine. Bigger, more powerful, than the 120, it digs trench from 16 in. to 42 in. wide and to 12½ ft. deep. An extra attachment for digging trench to 60 in. wide and 6 ft. deep. No soil condition too tough for this ditcher. Digs 75% of all ditching jobs — profitably.

Dig to the left. Puts trench within 4 in. of curb or similar low obstructions.



Digs in any intermediate position. Set the boom where you want it. Dig forward or in reverse — tunnel under sidewalks, dig manholes, etc., saves days of hand labor.

Dig to the right. Puts trench within 10 in. of poles or similar high obstructions.



THE BUCKEYE TRACTION DITCHER CO., FINDLAY, OHIO

CLYDE WHIRLEYS . . .

Designed for all work that requires a traveling, long reach, heavy duty steel derrick.

- Easy Swinging
- Large Loads
- Scientific Design
- Long Life
- Sturdy Construction
- Easy Erection

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CLYDE IRON WORKS, Inc.
Duluth, Minn.

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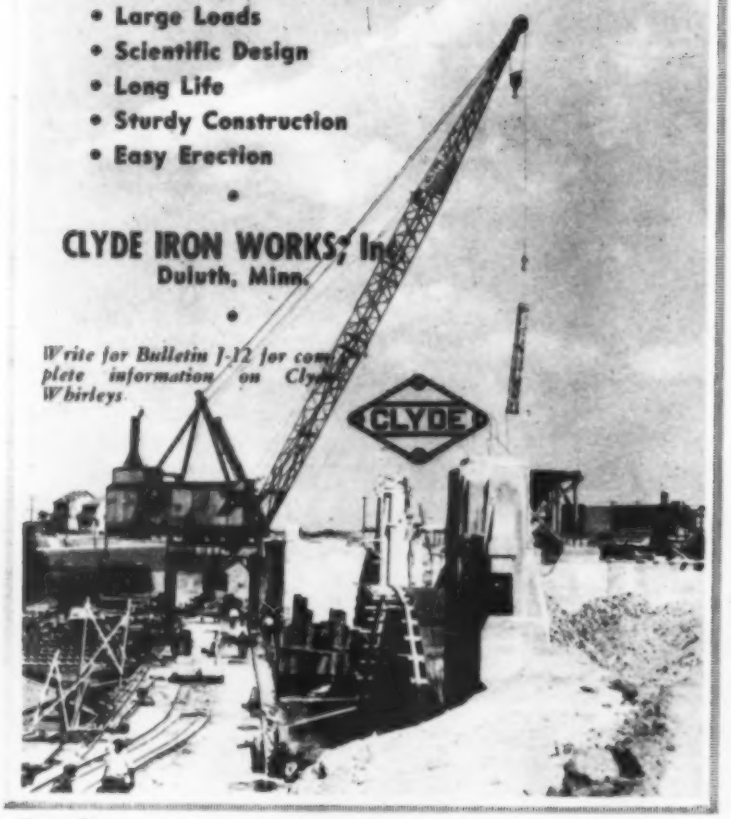
Write for Bulletin J-12 for complete information on Clyde Whirleys



MOVING MOUNTAINS

That's about the only thing Trackson Shovels aren't called upon to do. They not only excavate under the toughest conditions — rocky soil, gumbo and sticky clay — but also move, load, strip, terrace, fackfill, clean up and do hundreds of odd jobs faster, better and cheaper than any other piece of equipment. Always in demand. Get the facts on this year-round Money Maker. Write Trackson Company, Dept. B, Milwaukee, Wisconsin.

TRACKSON HIGH SHOVEL

FOR THE HOUSE OF DAVID WAREHOUSE

It's pumped in place with the

NEW REX 160 PUMPCRETE!

There are 8000 yards of concrete to be placed in the new cold storage warehouse being built by the House of David Colony of Benton Harbor, Michigan.

It's a job that is large enough and also small enough, with many scattered pours, to prove the new 160's superiority, as the contractor says, "over the tower, hoist, chute and buggy method of getting concrete into widely separated beams, slabs and columns—on *any* size building."

He towed his Rex 160 to the job, set it up in less than three hours—placed up to 200 yards per day with it. With two pipe lines in place—one to the top of the forms, one to the basement, he has alternated the pumping between the two—keeping up an almost steady placement program.

Like most 160 owners, he did not buy this completely portable concrete pump for only one job but to use on his many small jobs including walls, foundations, underpasses, overpasses, culverts, bridges, and small housing projects.

15 to 20 yards per hour!

REX

PROCESS—GIESE • SYSTEM—KOOYMAN

PUMPCRETE

Learn more about this new low-cost concrete pump that combines capacity with portability for low-cost concrete placement. The folder, "A Message for You," will be sent free at your request.

SEND THIS COUPON TODAY!

CHAIN BELT COMPANY
1664 W. Bruce Street
Milwaukee, Wisconsin

Please send me the folder—"A Message for You," which has information on the Rex 160 Pumpcrete.

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City ..... *State* .....

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THERE'S NOTHING LIKE EXPERIENCE

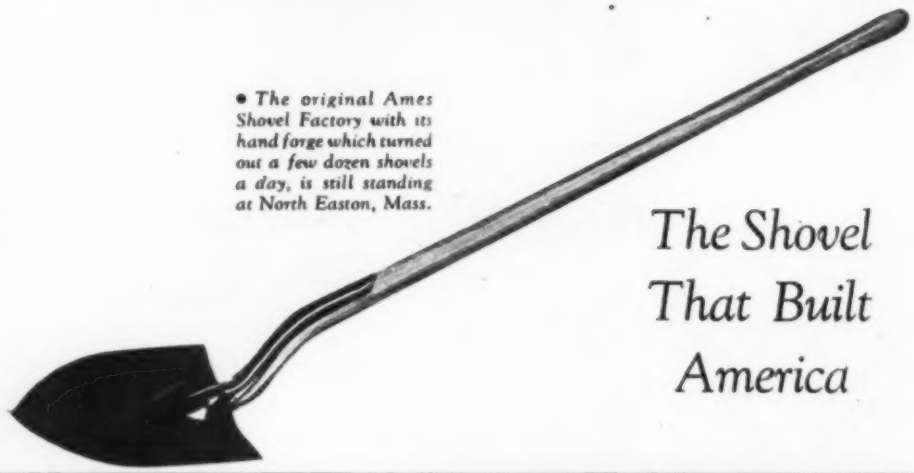
• Way back in 1774, when John Ames set up his hand forge and began making Ames Shovels, little did he realize that his efforts marked the beginning of the world's largest shovel company . . .

Since John Ame's time, millions of shovels have been made and much has been learned about shovel making . . . Every shovel that comes from the Ames Baldwin Wyoming Company's plants is the result of one hundred and sixty-three years of shovel-making experience.

In buying, just as in manufacturing, nothing takes the place of experience and buyers of today have learned from experience that, dollar for dollar they get more for their money in an ABW Shovel!

AMES BALDWIN WYOMING CO.
PARKERSBURG, W. VA. • NORTH EASTON, MASS.

• The original Ames Shovel Factory with its hand forge which turned out a few dozen shovels a day, is still standing at North Easton, Mass.

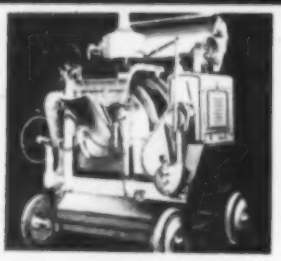


The Shovel That Built America

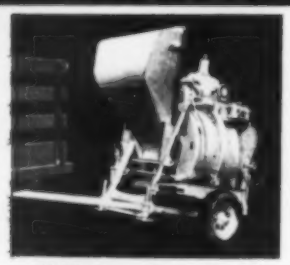
SINCE 1774

SHOVELS, SPADES, SCOOPS, FORKS, HOES, RAKES, POST HOLE DIGGERS

→ PROFIT MAKERS
NEW CMC MIXERS



CMC 7s and 10s End Discharge Models. New—compact—fast. The advantages of a speedy trailer with four wheel stability.



CMC 5s — 7s — 10s Two Wheelers. The fastest moving — fastest working one and two bag Mixers ever developed.

GET THOSE JOBS DONE IN A HURRY!

Don't take chances with old, worn-out equipment. See the new, fast, completely modernized CMC line of Mixers — all sizes—Wonder Tilters, Dumpover Pneumatic Tired Carts (See Illustrations), Hoists, Pumps, Saw Rigs, Wheelbarrows.

Write Today For Latest Catalog.

CONSTRUCTION MACHINERY CO.
WATERLOO, IOWA

BETTER PERFORMANCE
LONGER SERVICE
ON ANY JOB

"DIXON" AIR HAMMER COUPLINGS

Designed and built to withstand the continual vibration of hand hammers and rock drills, this Dixon coupling has a longer, consistently economical service life on the toughest job. And, like the "Boss," it is rust-proofed by Cadmium Plating.

"BOSS" HOSE COUPLINGS

Used for steam hose, steam hammers, air, hydraulic or road builders' hose . . . "Boss" Couplings have no equal for dependability in service. Parts are of steel or malleable iron to withstand abuse . . . Cadmium Plated for rust proofing.

Furnished in Washer or Ground Joint Type.

DIXON
VALVE & COUPLING CO.
LOS ANGELES PHILADELPHIA HOUSTON

Carried in Stock by Leading Rubber Manufacturers and Jobbers.

They fought nature 24 HOURS A DAY!

Day and night . . . through swamps and woods . . . Shell helped this company win its battle against the elements!

THE C. & R. Construction Co. of Roslindale, Mass., had been awarded a contract for the construction of the North Metropolitan Relief Sewer. Shell was called in to help prepare for this job.

The C. & R. equipment—cranes, pumps, tractors and bulldozers—all was thoroughly inspected and supplied with the proper Shell Lubricant.

Then came the test! The C. & R. Construction Co. found themselves facing one of the toughest jobs of their career. Over entirely undeveloped country . . . swamps and woods, in all weather, their equipment had to operate 24 hours a day. At almost all times, abrasives and dust were constantly present.

And C. & R. came through on schedule! Aided by Shell Lubricants, they battled nature 24 hours a day . . . proved that—under even the toughest conditions—Shell products can be counted on to stand the gaff!

In winning its battle this construction company was aided by Shell's "Invisible Element"—resourcefulness gained from solving the tough operating problems in every American industry. This *plus* in lubrication that has helped so many others is always ready to aid you. Write or phone your nearest Shell office.

SHELL

SHELL *CONSTRUCTION* **LUBRICANTS**

They'll hold that line against Time and Tide!

GOODALL

"SSS RED RING"

DREDGING

SLEEVES

You can insure continuous, trouble-free operation of the pipe line from the dredge by using GOODALL "SSS Red Ring" Dredging Sleeves for the pipe connections. These sleeves form tight yet flexible joints that not only withstand high pumping pressures and the constant twisting strain due to tidal sway, but are so constructed that they will actually show less abrasive wear than the pipe itself.

Given the operating conditions, we will construct the sleeves of the proper length, number of plies, and thickness of tube.

Made in all sizes from 6" to 36" I. D. Built to pass government specifications.

GOODALL RUBBER COMPANY

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New York • Pittsburgh • Chicago • Cleveland • Houston

GOODALL MECHANICAL CORPORATION

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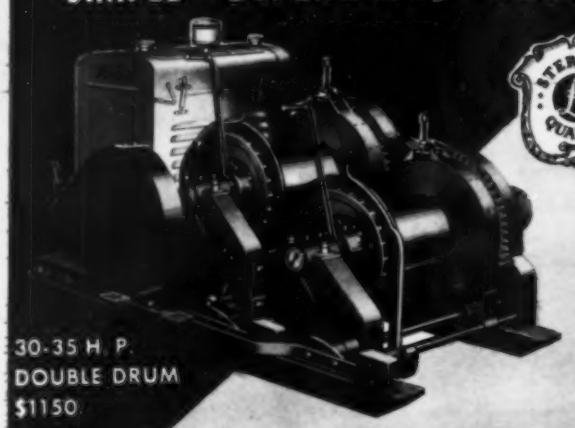
FACTORY: TRENTON, N. J. *Distributors in Principal Cities*

GOODALL — The originators of the "Standard of Quality" Line (Reg. U. S. Pat. Off.) of contractors rubber goods

STERLING HOISTS

SIMPLE — DEPENDABLE — RUGGED



30-35 H. P.
DOUBLE DRUM
$1150

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Find out why Sterling Hoists are used and recommended by Leading Contractors Everywhere

Timken Bearing Equipped
Johns-Manville Asbestos Frictions
Alemite-Zerk Lubrication
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with Positive Clutch Release Cut Gears

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MACHINERY CORPORATION
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A MORETRENCH WELLPOINT SYSTEM GIVES DRY RESULTS ON ANY WET JOB — QUICKLY, EFFICIENTLY, AND ECONOMICALLY.

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MORETRENCH CORPORATION

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When TIME *means* MONEY *to* YOU

. . . call your J&L Warehouse for Emergency Steel Service

INCREASE YOUR PROFITS WITH J&L STEEL

Your J&L Warehouse is instantly available to help you in an emergency . . . for the fabrication of steel to your order in the shortest possible time.

Jones & Laughlin Warehouses are fully equipped for cutting, bending, forming, welding and fabricating steel to meet your exact needs. J&L Warehouses carry large and complete stocks of steel shapes and plates in a wide variety of sizes . . . there is no delay in securing the right materials for the job. Trained engineers and experienced workmen assure speed . . . accuracy . . . strength and safety . . . completely satisfactory work.

Avoid costly delays. Save time and money with high quality Jones & Laughlin Steel . . . fabricated on time to meet your needs for service and safety. Call your J & L Warehouse.

Arc-welding Diesel Engine base. (*Above*) Fabricating guide tower for driving piling at New York World's Fair.

JONES & LAUGHLIN STEEL CORPORATION · PITTSBURGH

MAKERS OF HIGH QUALITY IRON AND STEEL PRODUCTS SINCE 1850

J&L WAREHOUSES

PITTSBURGH	CINCINNATI	DETROIT	NEW ORLEANS	CHICAGO
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Operated by Jones & Laughlin Steel Service, Inc., formerly National Bridge Works

MEMPHIS, 1 Auction Ave.—5-1625 . . . Distributing Warehouse for Pipe, Sheets, Spikes and Wire Products. Reinforcing Bar Warehouse and Fabricating Shop

LOUISVILLE, N. W. Cor. Tenth and Lee Sts.—Magnolia 1693 . . . Stock of Bars for Concrete Reinforcement and Bar Fabricating Yard

FOR EVERY NEED . . . THE RIGHT QUALITY OF STEEL IN A FULL RANGE OF SIZES

THE THEW SHOVEL COMPANY

CRANES, SHOVELS AND DRAGLINES

LORAIN, OHIO • U. S. A.

March 25, 1937

McGraw-Hill Publishing Company
330 W. 42nd Street
New York, N.Y.

Gentlemen:

Recently while reviewing some historical data of The Thew Shovel Company, I came across some of our very early advertisements, and thought the story they revealed might interest you.

The original Thew Shovel was built in 1895. The company, which was formed to manufacture them, was incorporated in 1899. I find that the first Thew advertisement appeared in the June 28, 1900 issue of Engineering News. This was about a one-eighth page advertisement which ran continuously on a weekly schedule until about 1907 at which time it was increased to quarter pages, then to half pages in 1909.

It was about this time that our first advertisement appeared in Engineering Record on the basis of one-half page each issue. When these papers were consolidated in 1917 into Engineering News-Record, we increased our schedule to full pages.

We were an advertiser in the initial issue of Successful Methods published in July 1919 and since that time have advertised consistently in it and its successor, Construction Methods and Equipment.

If you are interested in our opinion of the value of your publications, I think you will find it in the story of the continuity of our advertising in Engineering News-Record over the past 38 years and in Construction Methods and Equipment since its founding 19 years ago. During this period, The Thew Shovel Company has grown and prospered. We feel that one of the necessary elements in our future growth and prosperity lies in the continued use of such publications.

Yours very truly,

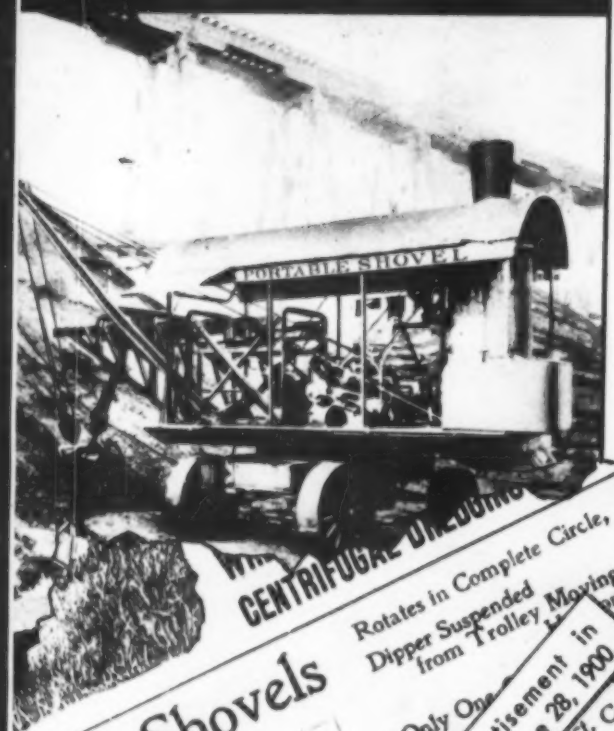
THE THEW SHOVEL COMPANY

C. B. Smythe

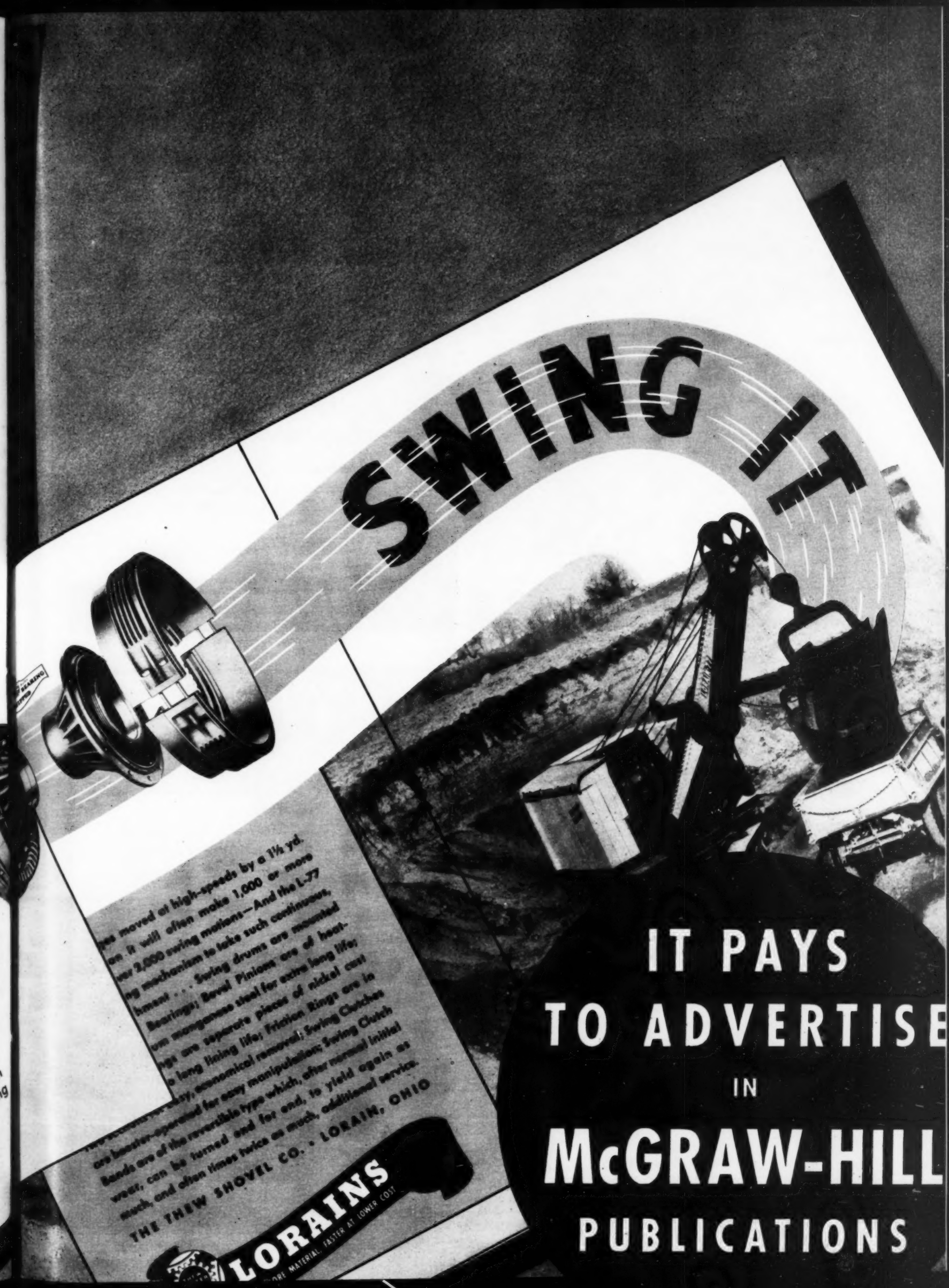
Vice President

Smythe:HR

First Thew Shovel of Early 1900 Vintage.



38 YEARS of advertising without a break isn't something that an advertising manager can set down in black and white as a definite plan of action. Rather, it is something that grows with the perennial satisfaction of having found in advertising something that is as necessary to sound management as design, production, accounting, selling and insurance. It has been a pleasure for Engineering News-Record and Construction Methods & Equipment to have participated with Thew Shovel Company for so many years, in the building business.


SWING IT
ges moved at high-speeds by a 1½ yd.
on. It will often make 1,000 or more
ver 2,000 swing motions—And the L-77
ng mechanism to take such continuous,
hment . . . Swing drums are mounted
Bearings; Bevel Pinions are of heat-
om manganese steel for extra long life;
gs are separate pieces of nickel cast
o long lining life; Friction Rings are in
asy, economical removal; Swing Clutches
are heavy-duty, economical removal; Swing Clutches
are booster-operated for easy manipulation; Swing Clutch
Bands are of the reversible type which, after normal initial
wear, can be turned end for end, to yield again as
much, and often times twice as much, additional service.
THE THEW SHOVEL CO. • LORAIN, OHIO
LORAINS
MORE MATERIAL, FASTER AT LOWER COST
IT PAYS
TO ADVERTISE
IN
McGRAW-HILL
PUBLICATIONS

RELIANCE SAND & GRAVEL SPREADER

Spreads wet or dry

No Rehandling • No loss of material

ANY WIDTH FROM 8 TO 60 FT.

Will handle up to 60 tons an hour

• A SINGLE MACHINE HAS SAVED ITS COST NEARLY 10 TIMES IN 1 YEAR . . .

OTHER RELIANCE PRODUCTS

Rock Crushers
Bucket Elevators
Revolving Screens
Street Sweepers
Storage Bins
Heating Kettles
Wash Boxes
Feeders
Belt Conveyors
Power Units

spreads ahead of spreader and truck

SPREADS 5 TO 15 MILES PER HOUR

Equally valuable for both Winter and Summer use — Summer — Covering oil; Building Sand and Gravel Highways; Resurfacing bituminous Roads.
Winter — Sanding icy hills and turns.

send for catalog

UNIVERSAL ROAD MACHINERY CO.
KINGSTON, N. Y.

HAISS *Hi-power* FOR EXCAVATING

High power in fact as well as name. Haiss distribution of weight and high-power closing ratios enable you to dig BIGGER PAY LOADS. The Bucket with lower sheaves that DON'T bury in the dirt.

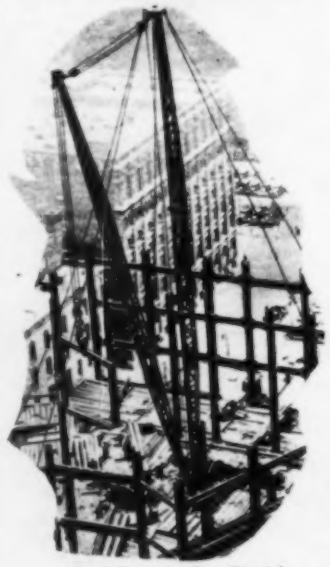
BE SURE TO READ BULLETIN 237!
Ask us to send a copy.

GEORGE HAISS MFG. CO., INC.
139th ST. & CANAL PLACE, NEW YORK, N. Y.
REPRESENTED IN ALL PRINCIPAL CITIES

ASK FOR BULLETIN 134 ON THE BIG 8 YD. HAISS LOADER

TRADE MARK DOBBIE ESTABLISHED 1862

All Steel DERRICKS



* Steel Erectors Guy Derrick, with Ball Bearing Footblock.

Guarantee Safety

When you guarantee safety, you economize — for safety means uninterrupted operation and lowest possible maintenance costs.

And DOBBIE All-Steel Derricks have been designed for safety and consequent economy. They have a safe load capacity of almost twice their rating. You need this assurance of dependable safety and continuous performance.

SAVE POWER BY USING BALL OR ROLLER BEARING FOOTBLOCKS AND SHEAVES. Built in both Guy and Stiff-leg types. Write for information and prices.

DOBBIE FOUNDRY & MACHINE CO.
Niagara Falls, N. Y.

Other Dobbie Products—Steel Derricks, Timber Derrick Fittings, Hand Winches, Motor Driven Winches, Blocks, Sheaves, etc.

GIANT TIRES MOVE MOUNTAIN

by LOWELL THOMAS,
NEWS COMMENTATOR

• "They're cutting down Iron Mountain and hauling it away on Goodrich Tires. It's in

Shasta County, California. A mountain of low grade gold ore called 'Gossan,' heavy in iron.

"First they blast to loosen the ore. Then big shovels scoop up earth, drop it in huge trucks for the haul to the mill.

"No ordinary trucks are these. They're big fellows with specially-built bodies reinforced with *steel rails*. Bodies so rugged that they stand the crushing jolt of a three or four-ton boulder dropped from the shovel.

"Tires, too, must take terrific battering. No chance to reinforce with steel here—just rubber and fabric to take the shock—to carry 20-ton loads over sharp, jagged rocks. Trucks fight for a footing—wind their way down the mountain—the tremendous weight shifting from one tire to another—all in all a tire job believed impossible only two or three years ago. But these are Goodrich Silvertowns—'earth movers' weighing almost 500 pounds apiece. Tires developed by Goodrich engineers for just such service. They tell me these tires have a load capacity as high as nine tons each—that they provide super-traction—that this is one of the greatest achievements of tire engineers."

Not many truck owners have jobs such as this at Iron Mountain. But every owner wants to get the same long mileage, freedom from delays and low cost of operation.

Goodrich Truck Tires give that kind of service on every job. The same basic construction that makes the tires stand up on the job of moving Iron Mountain is now used in every Goodrich Silvertown! On your hauls, whatever they may be, you can now get long, trouble-free mileage at new low cost.

TIRES TRIPLE PROTECTED

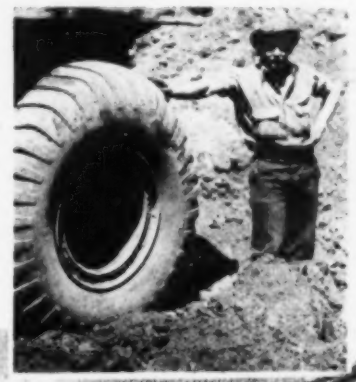
It's because these truck tires are Triple Protected in the sidewall. Built with an invention that checks 80% of premature failures. Only Goodrich gives you this 3-way safeguard:

1 **PLYFLEX**—distributes stresses throughout the tire—prevents ply separation—checks local weakness.

2 **PLY-LOCK**—protects the tire from breaks caused by short plies tearing loose above the bead.

3 **100% FULL-FLOATING CORD**—eliminates cross cords from *all* plies—reduces heat in the tire 12%.

When you can get these tires without paying a penny premium, can you afford to take chances on tires without Triple Protection? See a Goodrich dealer today—ask him to give you proof of savings.



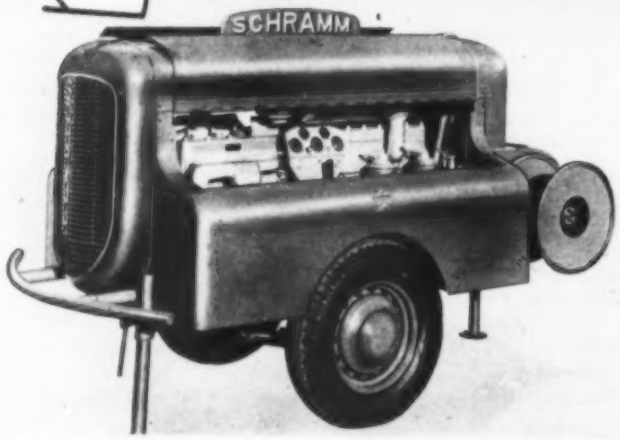
Goodrich *Triple Protected* **Silvertowns**

SPECIFY THESE NEW SILVERTOWN TIRES FOR TRUCKS AND BUSES

LIGHTWEIGHT COMPACT

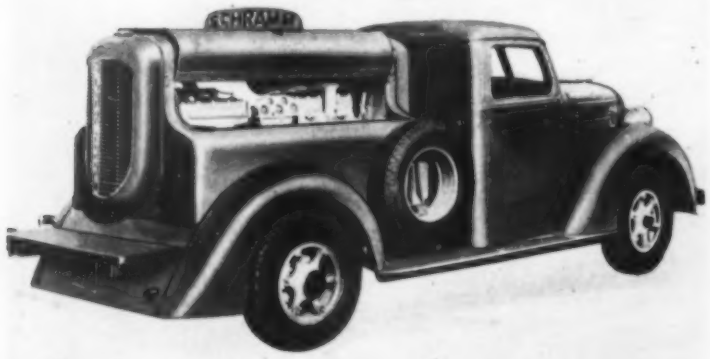
new utility

compressors



• *Above* — LIGHTWEIGHT "Utility" Compressors in DeLuxe mounting style reduce weight as much as 2000 lbs. — save hauling costs

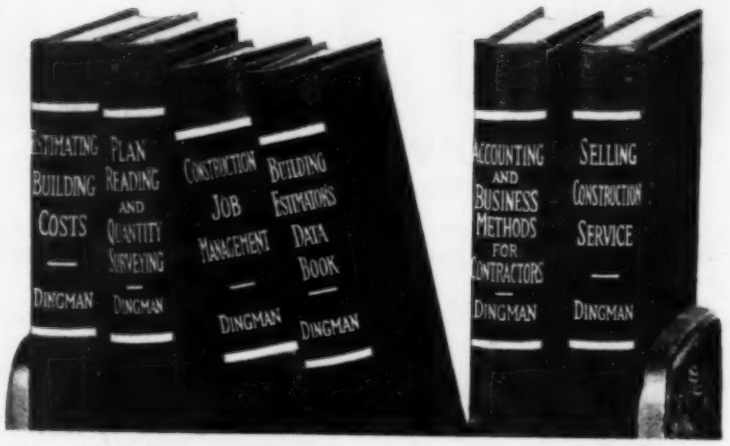
• *Below* — A model 105 "Utility" on ¾ ton truck. COMPACT "Utility" dimensions mean smaller trucks — lower transportation costs.



SCHRAMM "Utility" Compressors are the lightest, most portable, most compact compressors ever built. With surplus weight eliminated, transportation and labor savings mount to new heights — costs go down. "Utility" sizes from 85 to 420 cu.ft. actual air delivery — either gasoline or diesel engine powered. Seven mounting styles for all models. Buy the "World's Most Modern Compressor" — the SCHRAMM "Utility".

Write for SCHRAMM Bulletin 3700-CA
SCHRAMM, INC., West Chester, Pa.

SCHRAMM
AIR COMPRESSORS



Practical facts on every phase of building construction!

HERE is a Library of books that are packed to the covers with the best plans and methods for speeding up production, saving materials and labor, and cutting costs. These six books cover every phase of practical construction work from estimating building costs to the selling of construction service—from plan reading and quantity surveying to practical job management. With the aid of these books the contractor can get business in these dull times by learning how to make savings, and through them being able to make lower bids. The construction superintendent can learn how to keep costs down, which insures his job these days.

The Dingman Building Contractors' Library

The Dingman books have won a wide reputation among builders and building contractors for their sound, practical and easy-to-understand discussion of building construction work. All of the material has been drawn from actual practice.

This library is intended for

[1] The building contractor who wants a handy reference set that will give him almost instantly a ready answer to most of the problems that come up in the course of the day's work.

[2] The young men in the building industry who intend to make the business of construction their life work, and who want the kind of guidance that will aid them to climb to the top.

[3] Everyone in the building industry who wants to keep his job by increasing his usefulness and efficiency.

Each one of the volumes in this set is a complete handbook on some important subject. Sturdily bound and pocket size, it will go right "on the job" with you for immediate consultation.

Practical data is given on analyzing a construction job into its component parts—estimating the costs of labor, haulage, equipment, materials, etc. —plan reading and determining quantities from specifications—personnel management—successful supervision of every building operation—efficient and economical business methods—office procedure such as accounting banking, purchasing, etc.—advertising and selling methods for contracting service—and a complete data book of tables, forms and calculations most frequently used by the builder.

Free Examination—Small monthly payments

Without a cent of expense—without any obligation on your part—you may examine the Dingman Building Contractors' Library for 10 days and determine its value for yourself. Try the books out on your everyday problems—make them prove their worth to you. Unless they meet every test send them back at our expense. If the books prove satisfactory and you decide to keep them, pay only $1.50 in ten days and then $2.00 a month for six months.

Every contractor and builder, every architect and engineer, every student and executive, who is seeking practical help on the everyday problems connected with building construction work should have this valuable reference library.

McGRAW-HILL
FREE EXAMINATION COUPON

McGraw-Hill Book Co., Inc., 330 West 42d Street, New York, N. Y.

You may send me for 10 days free examination, the new six-volume Dingman BUILDING CONTRACTORS' LIBRARY. I agree either to return the books postpaid at the end of 10 days or send a first payment of $1.50 then and $2.00 a month for six months.

Signed .....

Address .....

City and State .....

Official Position .....

Name of Company .....

(To insure prompt shipment, write plainly and fill in all lines.) CM&E-9-37

HYDRAULIC CONTROL
in Ransome plus *built* PAVERS

With

HYDRAULIC CONTROL

RANSOME the pioneer in the concrete mixing field brings to the Paving Industry the revolutionary feature that means better control — smoother action — less maintenance expense and lost time.

Standard equipment on the NEW 1937 RANSOME 27-E Single Drum Pavers, the latest RANSOME creation.

The Dual Drum Paver gives a 50 to 75% increased production even over that of the RANSOME Single Drum Paver.

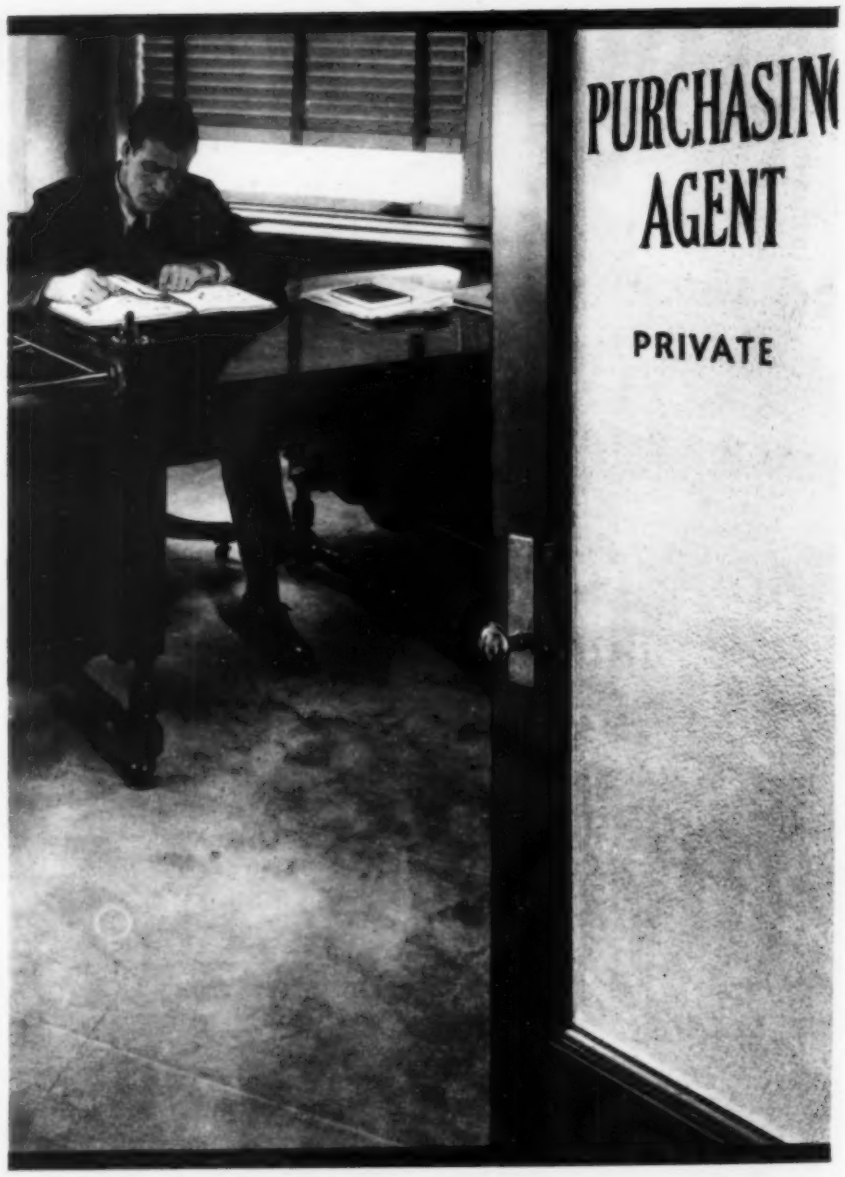
RANSOME CONCRETE MACHINERY CO.
Dunellen, New Jersey

DESIGNERS AND BUILDERS OF CONCRETE EQUIPMENT

Profits . . .

depend on knowing
how to buy as well
as *how to sell*

•



THAT'S why in every sizable company, you'll find a "Purchasing Agent"—a company buying expert, who finds, from sales interviews and studies, just where and how to buy everything his company needs and how much to pay for it.

The Purchasing Agent is always ready to be shown how your product can help stretch his company's dollar. More than that, he welcomes and expects your help in telling that story to his management executives. It's unfair to expect him to spend his time explaining an unadvertised, unknown product to them. It's part of your job to educate these executives through consistent business paper advertising, so that their good-will plus the P.A.'s reasons-to-buy will make the O.K. a routine matter.

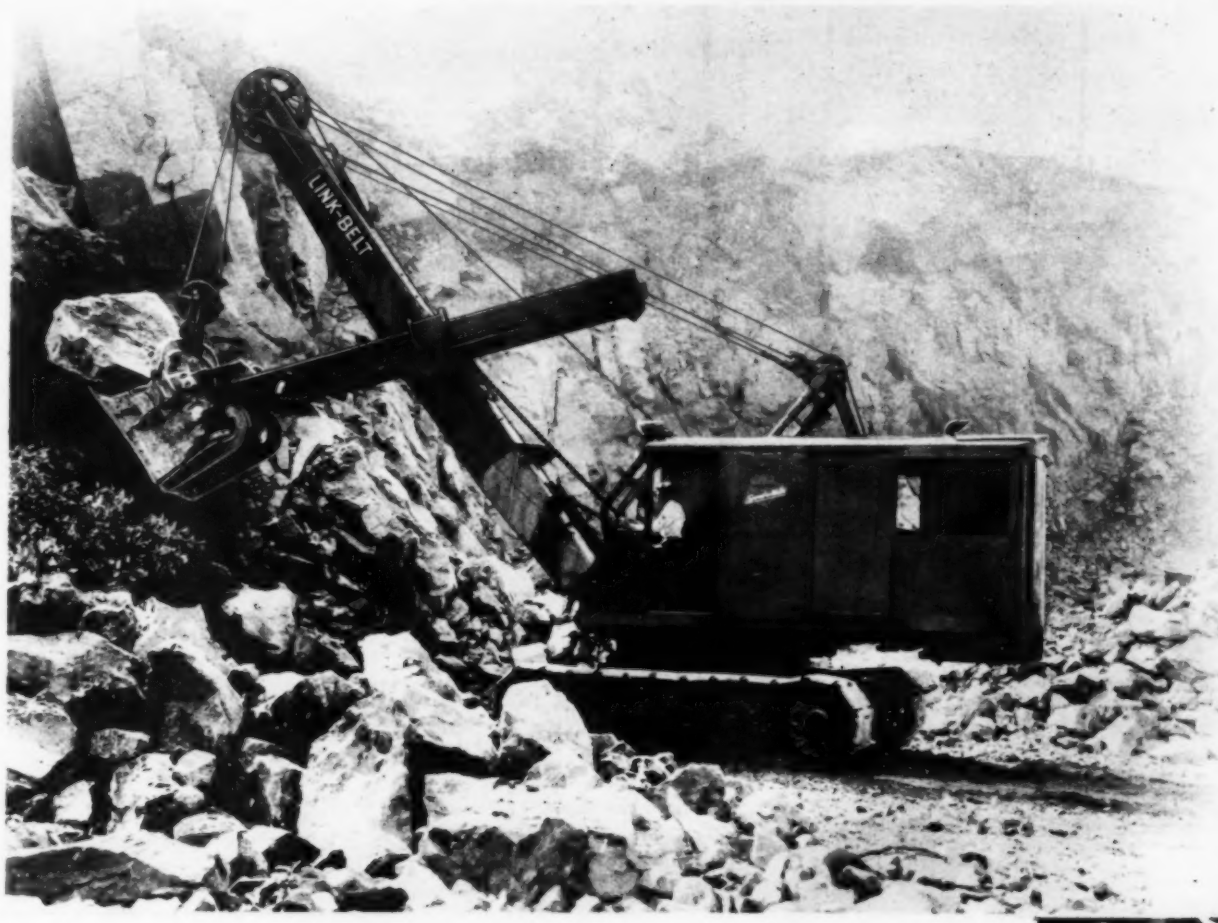
Your modern Purchasing Agent wants you to do this job through advertising, because it sells his management executives, yet allows him to protect them from time-consuming "cold turkey" calls and "missionary work." You'll want to do it *through advertising in the McGraw-Hill Publications*, because it costs ever so much less that way.

McGRAW-HILL PUBLICATIONS

McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York, N. Y.

American Machinist
Aviation
Bus Transportation
Business Week
Coal Age
Chemical and Metallurgical Engineering
Construction Methods and Equipment
Electrical Contracting
Electrical Merchandising
Electrical West
Electrical Wholesaling
Electrical World
Electronics
Engineering and Mining Journal
Engineering News-Record
Factory Management and Maintenance
Food Industries
Metal and Mineral Markets
Mill Supplies
Power
Product Engineering
Radio Retailing
Textile World
Transit Journal

"IT'S SO SIMPLE... *BUT WHAT AN IMPROVEMENT!"*



Development of Link-Belt Speed-o-Matic control puts manual-lever-operated shovels back in the class with automobiles you had to crank by hand.

Today you push a starter button in your car, drive farther and feel fresher at the end of the day. With the Speed-o-Matic control and its twist-of-the-wrist levers, you make more dirt "go places" all day without fatigue.

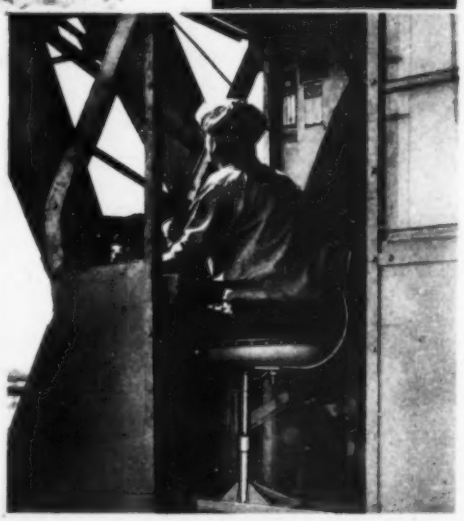
● When Link-Belt announced the revolutionary new Speed-o-Matic shovel-dragline-crane about a year ago, up-to-date operators approved, in principle, but asked, "Will it work?"

Today they know the answer . . . it comes from every section of the country . . . a big, positive "Yes!" A full year of field service, under all working conditions, has proved that Speed-o-Matic has equaled and surpassed the claims made for it from the start.

Users stress the simplicity and reliability of Speed-o-Matic control. Where they had thought a complicated set-up necessary for Speed-o-Matic's amazing results, they found merely a simple, practical, natural method of transferring the back-breaking effort of manipulating mechanical levers to operate the machine, from the operator to the power of the machine itself.

Send for Book No. 1745. Link-Belt Company, 300 W. Pershing Road, Chicago. Distributors and Offices in Principal Cities.

7151-A



LINK-BELT *Speed-o-Matic* SHOVEL DRAGLINE - CRANE

A Perfect Shoulder in ONE Operation

RIGHTLY PRICED
SOUNDLY ENGINEERED
NATIONALLY SERVICED

Two men, a tractor and an Insley Shoulder Finisher will grade and finish both sides of a mile of roadway in one day . . . every day (weather permitting) . . . and always a perfect job. This means one important thing . . . low cost.

There is a size and model INSLEY to handle every type of shoulder finishing. Write today for complete specifications and prices.

INSLEY MANUFACTURING CORP., INDIANAPOLIS, INDIANA

INVISIBLE DUST IS YOUR REAL PROBLEM

M.S.A. Comfo Respirators filter out dust particles a fraction of a micron in size . . . the dust you can't see—*the dust that Nature herself can't keep from the lungs.* And added to this protective efficiency is lightweight wearing comfort, low breathing resistance, long filter life and trifling maintenance expense. • *Let us arrange a demonstration for you—there's no obligation.*

MINE SAFETY APPLIANCES CO.

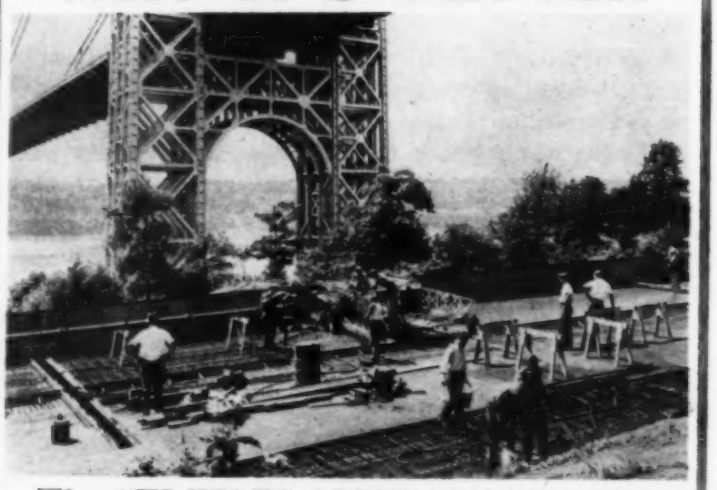
Braddock, Thomas & Meade Streets, Pittsburgh, Pa.
District Representatives in Principal Cities

M.S.A. Products include Breathing Apparatus . . . Inhalators . . . Comfo Respirators . . . Masks of all Types . . . Gas Indicators . . . Gas Detectors . . . Safety Goggles . . . Protective Hats and Caps . . . Edison Electric Cap Lamps . . . Safety Clothing . . . First Aid Equipment. Descriptive Bulletins sent on request.

U. S. BUREAU OF MINES APPROVED

M·S·A Comfo RESPIRATORS

"WHY IT'S BETTER"

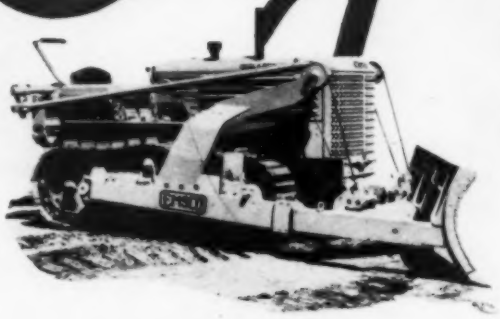


The "FLEX-PLANE" Finishing Machine "sound in principle and construction"—a single wide screed, unnecessary screeding and agitation of concrete, perfect control, screeds backward, as well as forward, universally used.

FLEXIBLE ROAD JOINT MACHINE CO.

WARREN • OHIO

Engineered TO ASSURE MAXIMUM EFFICIENCY and ECONOMY



EMSCO
Cable and Hydraulic
TRACTOR
EQUIPMENT

Ever since its introduction the Emsco line of cable and hydraulic controlled tractor equipment has been setting new high standards of efficient, economical performance under the widest range of operating conditions. Each unit is engineered to meet the conditions and requirements of the service involved embodying unique patented features that provide utmost simplicity, speed, flexibility and rugged strength, with low operating and maintenance costs over long periods of time. Records of outstanding performance in a wide range of service are available for consideration. Illustrated bulletin on any type unit mailed on request.

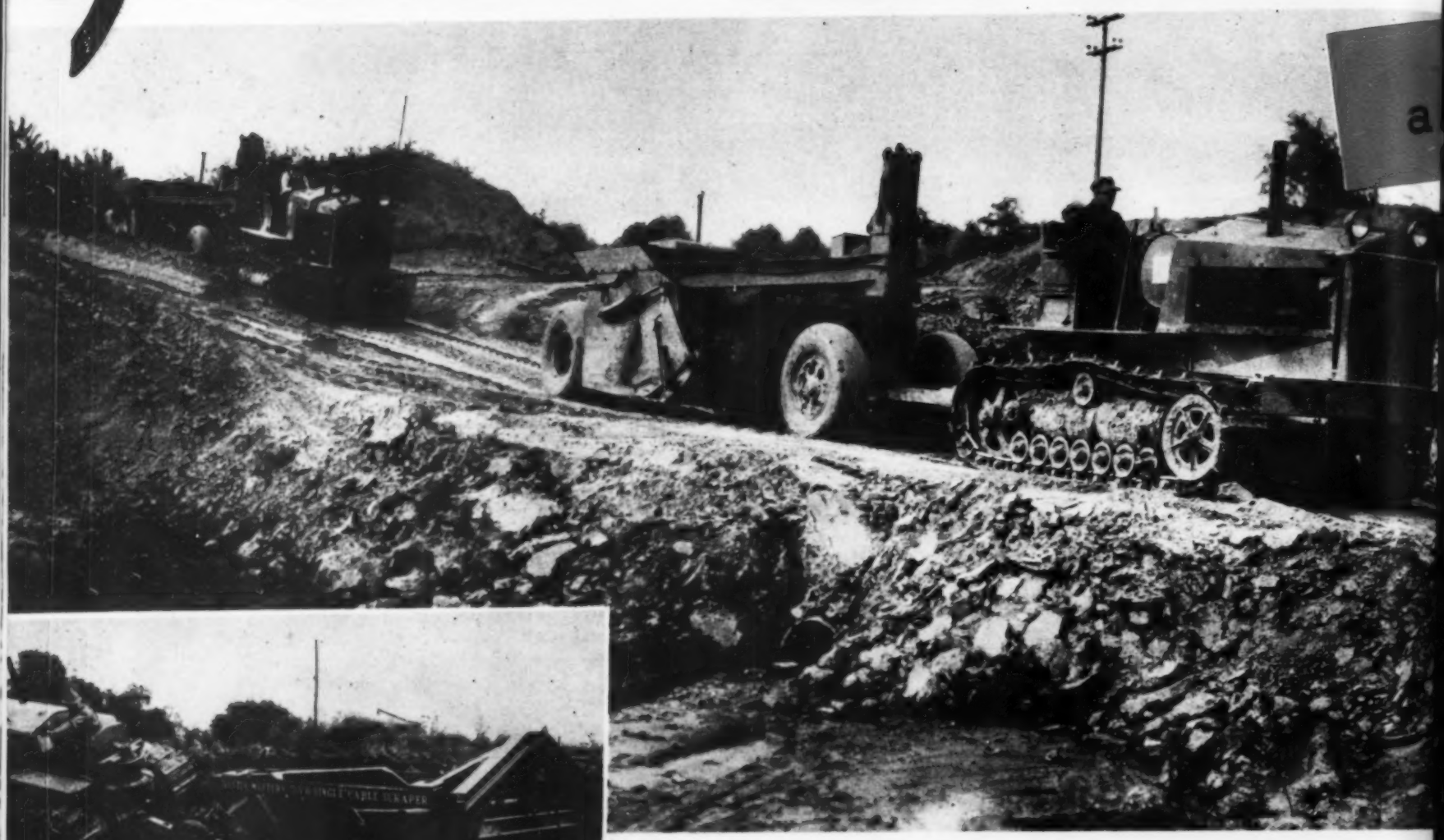
THE EMSCO LINE

Hydraulic and Cable Controlled:

Bulldozers
Trailbuilders
Rippers
Power Control Units

EMSCO DERRICK & EQUIPMENT COMPANY
TRACTOR EQUIPMENT DIVISION
General Offices and Main Plant: 6701-7101 South Alameda Street • Los Angeles, California
Eastern Sales Office: 332 South Michigan Avenue, Chicago, Illinois

Giant Loads



A tight spot like this shows advantage of the Cletracs' controlled differential steering . . . their ability to pull on both tracks at all times . . . to handle larger loads on the turns.

Real loads are these that two 12-yard Austin-Western Scrapers and Model F Cletracs are handling on a Pennsylvania dam job. Cletracs keep difficult jobs up to schedule . . . they move more dirt at lower cost.

Cletrac

Crawler Tractors

Diesel, Tractor Fuel, Gasoline . . . Six Size

...at Pigmy Costs

a Cletrac combination that spells P-R-O-F-I-T-S

Hauling bigger loads is one way of fattening profits on the job. Cutting costs is another.

But when you can do both together, you have a combination that spells profits in no uncertain terms.

Increase loads and cut costs are two things which Cletracs can do for you.

With Cletrac Controlled Differential Steering, an exclusive Cletrac feature, both tracks are pulling at all times, on the turns as well as on the straightaway. The load keeps moving . . . there is less inertia to overcome. You handle larger loads . . . or the same size load at higher speed.

Balanced design, which combines lightness in weight with maximum traction, increases capacity on grades as much as 19 per cent on a 30 per cent grade. Again, it takes fewer trips to do a given job.

And because of Cletrac's wonderful simplicity, Cletracs are easier and simpler to maintain. Steering bands can be adjusted in less than fifteen minutes; replaced in not much longer. Clutch can be adjusted in five minutes; replaced without disturbing either engine or transmission.

Now add the rigid main frame . . . the dead axle shaft that helps absorb the jolts and bumps of hard going . . . the solid side frames . . . the fully supported and protected engine. Little wonder that Cletracs have gained a world wide reputation for their "Built to Endure" construction.

The Cleveland Tractor Company
Cleveland, Ohio

No trouble at all is it for this Cletrac Model DD Diesel to handle a 5-yard Austin-Western Scraper near Mundelein, Illinois.

It takes power to pick up a 12-yard load as this Austin-Western Scraper is going near Williamstown, Mich. And a Cletrac Model FD has it.

Cletrac
Crawler Tractors
Built To Endure

The only tractors with controlled differential steering that keeps both tracks pulling at all times . . . on the turn as well as on the straightaway.

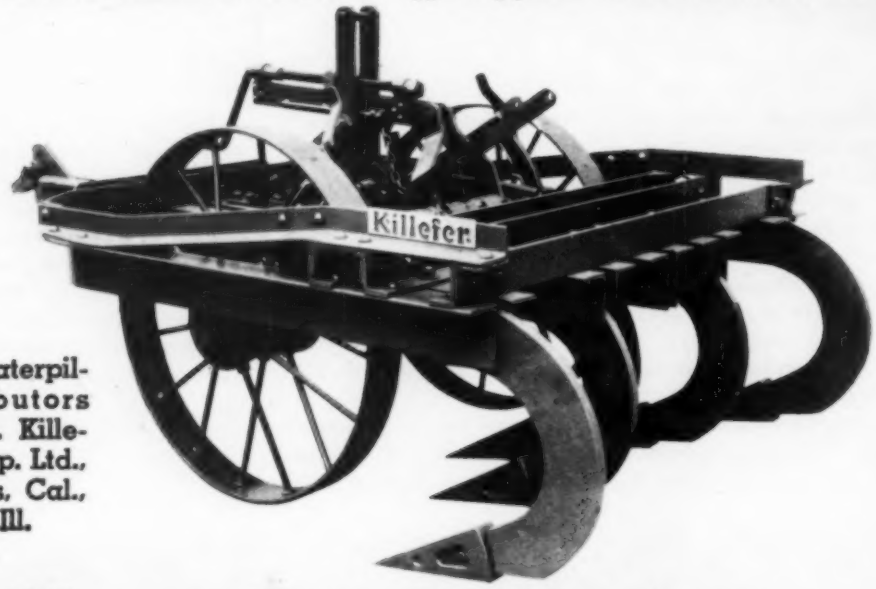
ize . Fifteen Models . . . 22. to 94. Horsepower

Killefer road equipment

- Revolving Scrapers
- Revolving Rippers
- Regular Rippers
- Road Discs, or Planers
- Compacting Harrows
- Oil-Mix Cultivators
- Ditchers
- Mole-Drain Machines

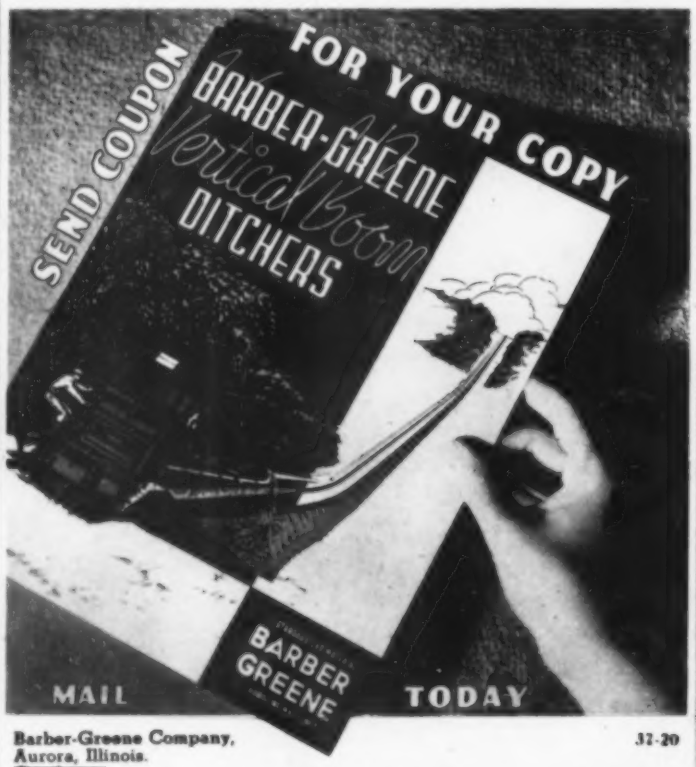
Write for Literature

A POWERFUL medium-weight ground breaker built for long hard service. For tractors of 35 to 45 HP. Has five heat-treated standards and points spaced 12" apart. Maximum working depth 12". Lift mechanism is self-contained, simple and positive. Frame is hot-riveted, has generous clearance and is designed for short turning. Working depth adjusted by crank. Weight 3150 lbs. We also build lighter and heavier type rippers. Write for folder 22 DA.



Sold by "Caterpillar" Distributors everywhere. Killefer Mfg. Corp. Ltd., Los Angeles, Cal., Peoria, Ill.

No. 9 Road Ripper



Barber-Greene Company, 37-20
Aurora, Illinois.
Gentlemen:
Please send me your new 36-page catalog which shows all five Barber-Greene ditchers, giving complete specifications and 14 pages of job photos. I understand this incurs no obligation.

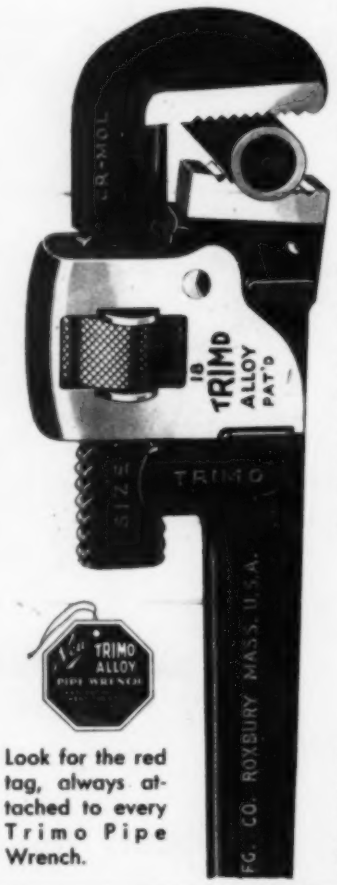
Name .....

Company .....

Address .....

City ..... State .....

★ EFFICIENCY ★



Look for the red tag, always attached to every Trimo Pipe Wrench.

As building increases in volume, new efficiency characterizes construction methods. Keeping pace with this new efficiency is

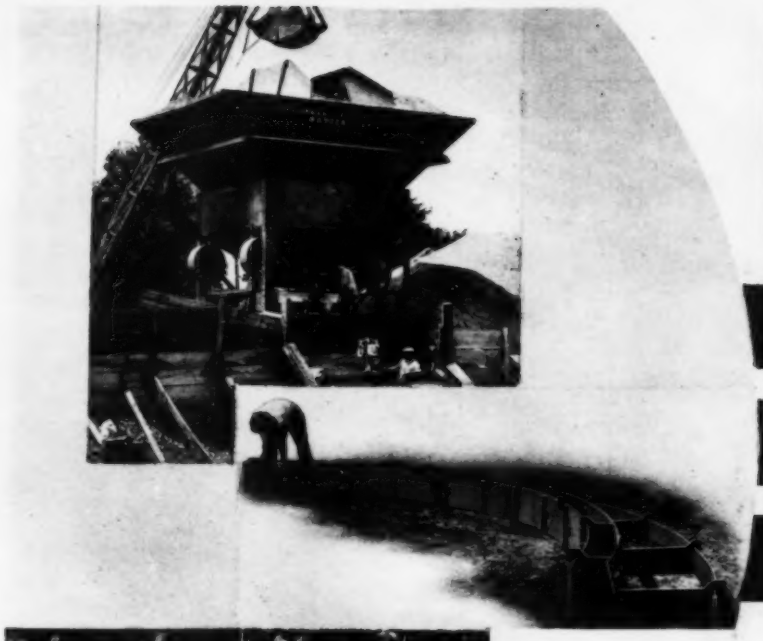
TRIMO

an efficient pipe wrench because it is made of Chrome Molybdenum Nickel Alloy Steel, Drop Forged . . . hangs on with a grip that means maximum safety . . . replaceable parts give maximum economy.

TRIMONT MFG. CO., INC.
Roxbury (Boston), Mass.

TRICROME
CUTTER WHEELS

Made of thin blade special analysis steel, silvered to resist rust. Identified by the red hub. Made especially for Trimo Pipe Cutters but can be used in other types.



I CAN GET EVERYTHING I NEED FROM ONE MANUFACTURER

ROAD FORMS

STREET FORMS

BINS *and* BATCHERS

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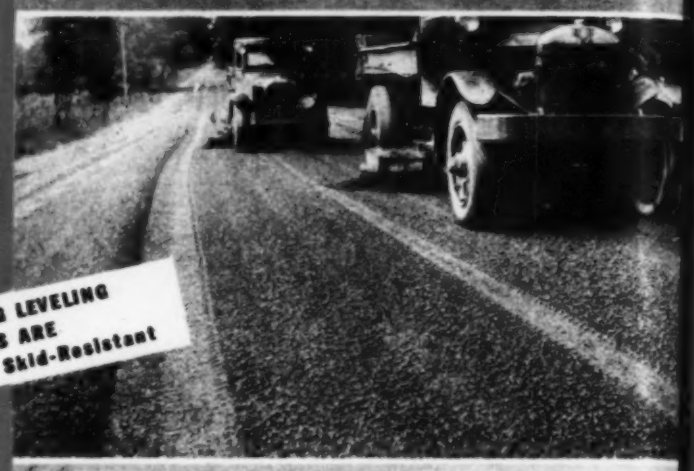

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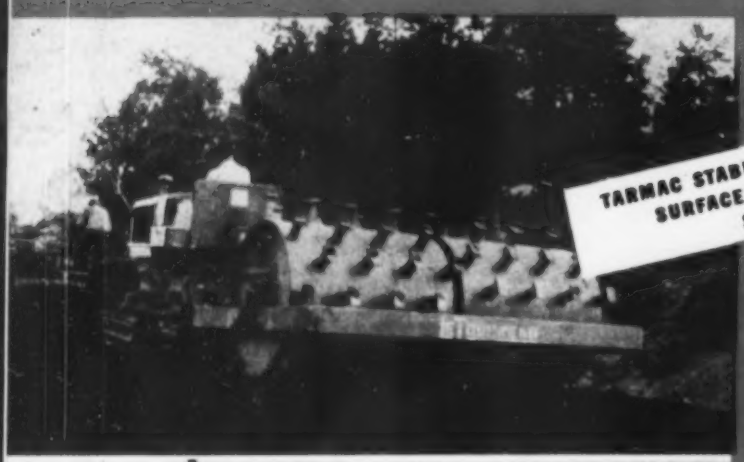

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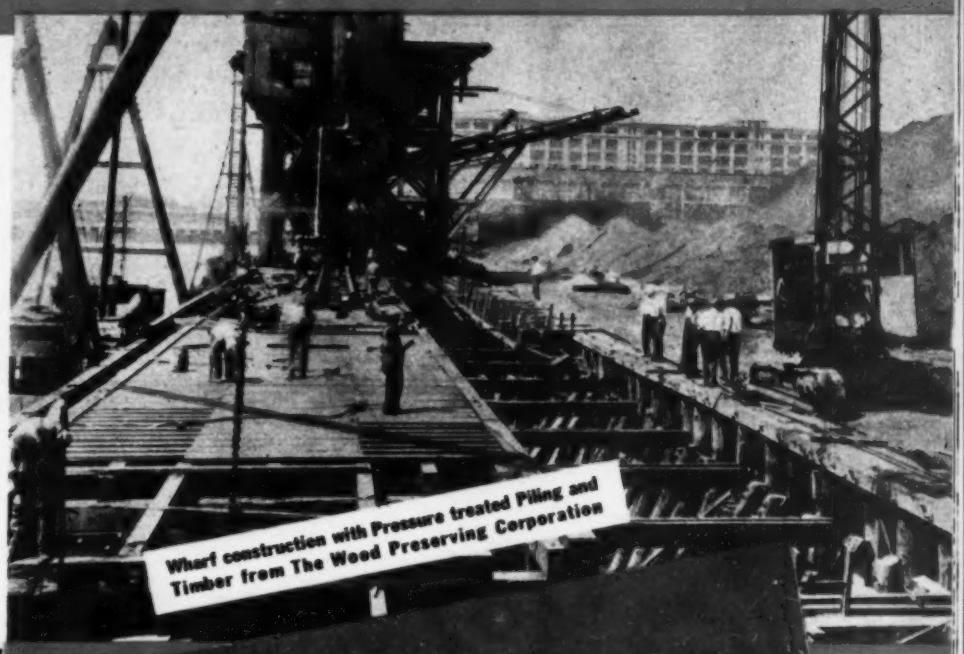

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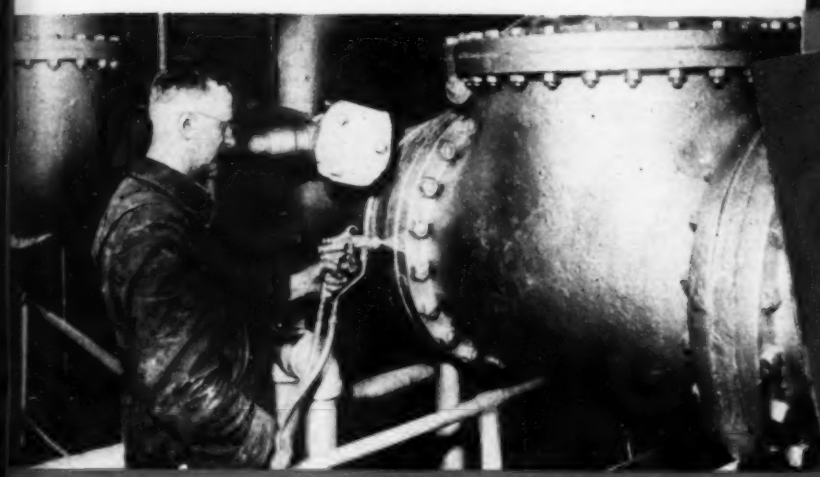

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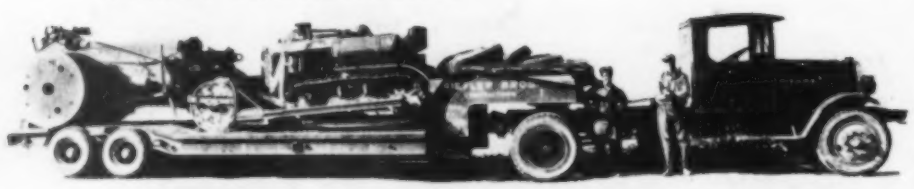

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